FOOD MANAGEMENT
AND
CHILD CARE
THEORY

VOCATIONAL EDUCATION
HIGHER SECONDARY - FIRST YEAR

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Untouchability is a sin
Untouchability is a crime
Untouchability is inhuman

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I. FOOD

Adequate nourishment is needed for healthy life of human beings. Food is essential for growth, development, active and healthy life of an individual. Nutrition is the science which deals with food. Nutrition signifies the nutrients and other components in food, their functions, relation between health and disease, harmonious living and integrated functions. Hence food plays an important role in an individual's health and nutritional status.

Nutrition is an important part of our life. The quality of our health depends upon the nourishment that we provide to our body. Our nutritional status is influenced by many factors as shown in Fig 1.1.

1.1. Basics of Food

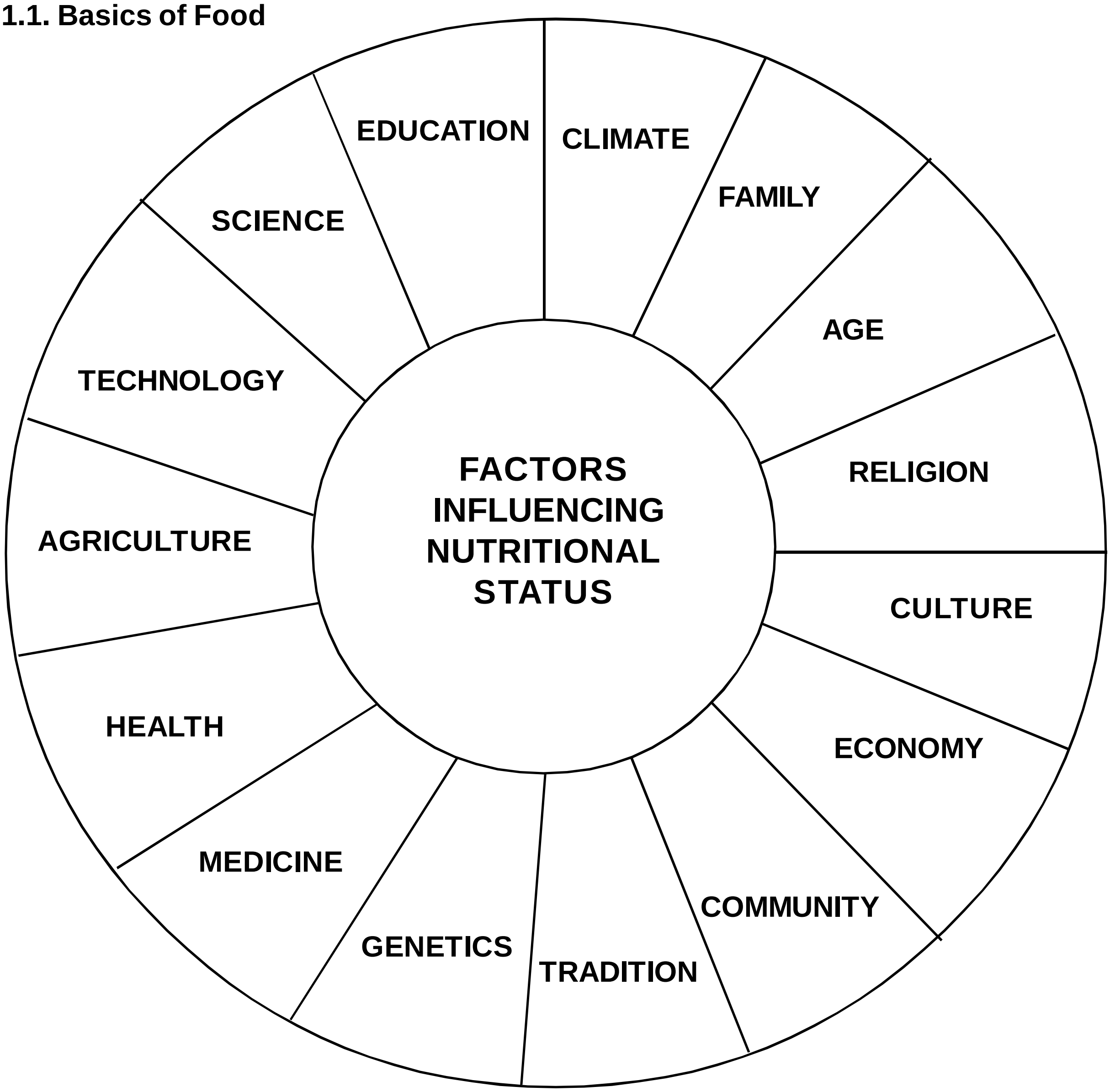


Fig. 1.1.

Food is the basic necessity of man. Food is a mixture of different nutrients such as carbohydrates, proteins, fats, vitamins and minerals. These nutrients are essential for growth, development and maintenance of good health throughout life. They also play a vital role in meeting the special needs of pregnant and lactating women and patients recovering from illness.

Functions of food

Food may be classified according to their functions as shown in Fig.1.2.

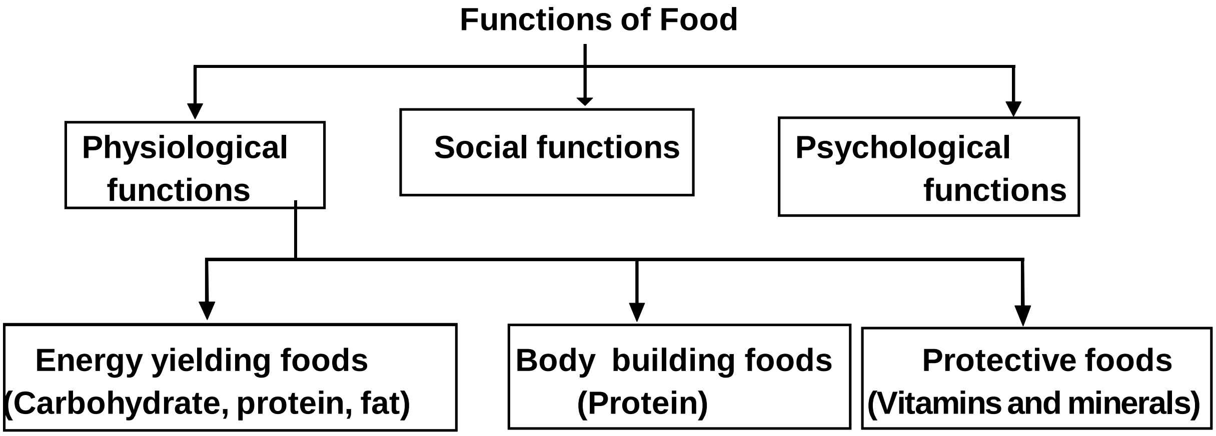


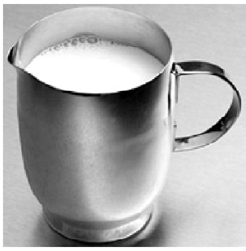
Fig. 1.2

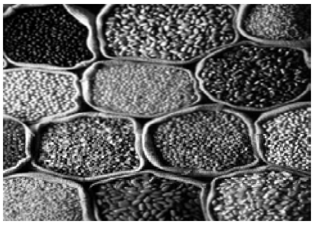
1) Physiological Functions of Foods

Table 1.1. presents the functions of food and sources of nutrients.

i) Energy yielding foods: Foods rich in carbohydrate and fats are called energy yielding foods. They provide energy to sustain the involuntary processes essential for continuous life, to carry out various professional, household and recreational activities and to convert food ingested into usable nutrients in the body. The energy needed is supplied by oxidation of foods consumed. Cereals, roots and tubers, dried fruits, sugar and jaggery, oils, butter and ghee are good sources of energy.

ii) Body building foods: Foods rich in protein are called body building foods. Milk, meat, egg and fish are rich in proteins of high quality due to the presence of all essential amino acids. Pulses and nuts are good sources of protein but the protein is not of good quality because they lack some of the essential amino acids. These foods help to maintain life and promote growth. They also supply energy.





iii) Protective and Regulatory foods

Foods rich in vitamins and minerals are known as protective and regulatory foods. They are essential for health and regulatory

activities such as maintenance of body temperature, muscle contraction, control of water

balance, clotting of blood, removal of waste products from the body and maintenance of heart beat. Milk, egg, liver, fruits and green leafy vegetables and other vegetables are protective and regulatory foods.

2. Social Functions of food

Food has always been associated with our community, social, cultural and religious life. It has been an expression of love, friendship and happiness at religious, social and family gettogethers.

3. Psychological functions of food

In addition to satisfying physical and social needs, foods also satisfy certain psychological needs of human beings. Foods also indirectly help to provide a sense of security, love and acceptance. For example, preparation of delicious foods for family members is an expression of love and affection.

Table 1.1: Functions of Food and Sources of Nutrients

Functions	Major Foods	Other Nutrients present in the food
Energy yielding	**Carbohydrates and fats :** Cereals, millets	Protein, fibre, calcium, iron and B-complex vitamins
	Roots and tubers,	Carotenoids, fibre,
	Vegetable oils, ghee, butter	Fat soluble vitamins, essential fatty acids
	Nuts and oil seeds	Protein, vitamins / minerals
	Sugar and jaggery	Iron (Jaggery alone)
Body building	**Proteins :** Pulses, nuts and oil seeds	Energy, B-complex vitamins, invisible fat, fibre
	Milk and milk products	Calcium, vitamin A, riboflavin (Vit. B_2),
	Meat, fish, poultry, egg	Fat, B-complex vitamins, iron, iodine
Protective and Regulatory	**Vitamins and minerals :** Green leafy vegetables	Antioxidants, fibre and other carotenoids
	Other vegetables / fruits	Fibre, sugar, antioxidants

Source: Dietary Guidelines for Indians – A Manual, National Institute of Nutrition, ICMR, 2005.

1.2. Definitions:

Health

It is defined by World Health Organisation (WHO) of the United Nations as the state

of complete physical, mental and social well being and not merely the absence of disease or infirmity.

Foods

Foods when eaten or drunk and absorbed by the body are to give energy, promote growth, repair worn out tissues and regulate body processes.

Nutrition

Nutrition refers to the processes in the body for utilizing food. It includes eating the appropriate kinds and amounts of foods for the body's needs, digestion of foods, absorption of the nutrients into the blood stream, use of nutrients by the cell for energy, growth and maintenance.

Nutrients

These are the constituents of foods that must be supplied to the body in suitable amounts. These include carbohydrates, proteins, fats, vitamins and minerals.

Nutritional status

It is the condition of the individual as influenced by the utilization of the nutrients. Adequate nutrition is essential for maintaining good nutritional status.

Malnutrition

It is an impairment of health resulting from a deficiency, excess or imbalance of nutrients.

Reasons for malnutrition

1. Intake of low quantity of foods
2. Intake of large quantities of foods than required
3. Nutrient content of the food is either very low or deficient
4. Abnormality in digestive capacity
5. Improper cooking and serving methods
6. Improper food habits
7. Lack of parental care
8. Poor economic status and lack of affordability to purchase nutritious foods.

Good nutrition

Good nutrition is the result of the intake of adequate foods both in qualtiy and quantity.

Undernutrition

Undernutrition refers to a deficiency of calories and or one or more essential nutrients. When the intake is less than the output it will lead to undernutrition.

Intake $<$ Output

Overnutrition

Overnutrition, is the result of excess of one or more nutrients and usually of calories, which disturbs the body function. When the intake is more than the output it is referred as overnutrition.

Intake > Output

Signs of good and poor nutritional status

The virtuous and vicious cycle of nutrition are shown in Fig. 1.3.

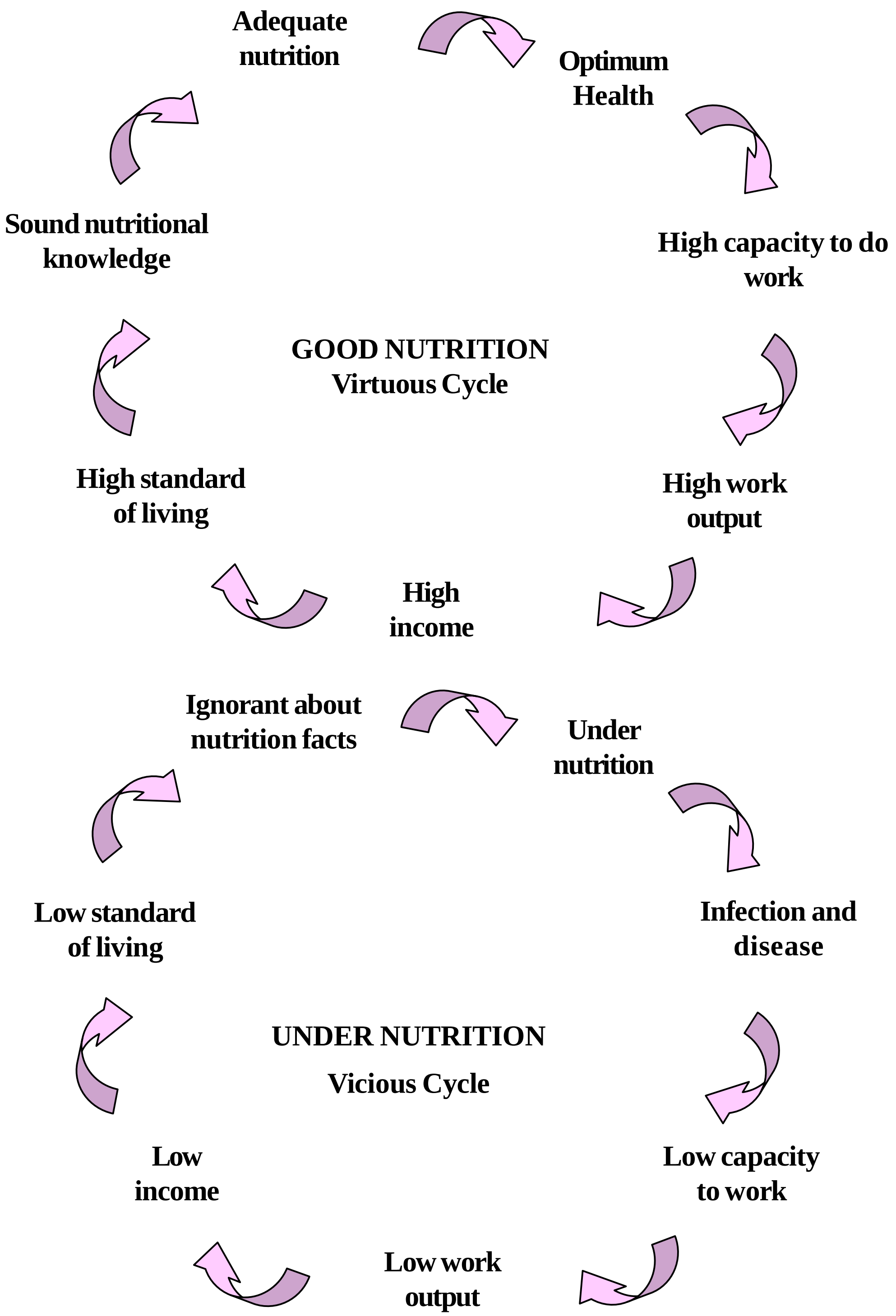


Fig. 1.3

Table 1.2 shows the signs of wellnourished and malnourished individuals.

Table 1.2 : Signs of Wellnourished and Malnourished Individuals

S.No.	Organ	Wellnourished	Malnourished
1.	Hair	Clean, black, silky and shiny	Thin, short, hair falling with dandruff
2.	Eyes	Sharp, clean, no watery discharge	Dull, eye lids swollen, watery discharge and spots in the eye
3.	Skin	Soft, shiny, clear and healthy	Dry, swollen, rashes and dull colour
4.	Nose	Clear, clean	Discharges seen and difficulty in breathing
5.	Mouth & Lips	With happy smile, tongue and gums in red colour without any bad odour	Lips swollen and thick with blisters, dull coloured and bad odour.
6.	Teeth & gums	Clean teeth, regular and strong without cavity	With tooth decay, stains, cavities, tooth falling, bleeding gums, swollen gums and bad odour.
7.	Throat	Clear	Red and white spots
8.	Chest	Good structure and form	Irregular shape and structure
9.	Hands & fingers	Clean and firm nails	Coarse and flat
10.	Stomach	Soft without wrinkles, no belly and no pain	Stomach pain, pot belly and wrinkled
11.	Legs	Good posture	Swelling, dry with cracks, bow legs, knocked knees
12.	Foot	Lie flat on the ground	Swelling, do not lie flat on the ground
13.	Posture	Head straight, shoulders, back, legs and hands in good posture	Bent back, shoulders and back not in good posture
14.	Weight	According to height and age, no sudden increase or decrease in weight	Thin or obese, increase or decrease in weight within a short period

1.3 Classification of Food Groups

ICMR Five Food Group

According to Indian Council of Medical Research (ICMR) foods may be broadly classified into groups based on their nutritive value such as carbohydrate, fat, protein, vitamins and minerals and the details are given in Table 1.3.

Table 1.3 : ICMR Basic Five Food Groups

Source : Nutritive Value of Indian Foods, National Institute of Nutrition, ICMR, (2007).

S.No.	Food Groups	Main Nutrients
1.	**Cereals and Products :** Rice, wheat, bajra, maize, ragi, jowar, barley, rice flakes, wheat flour and malted cereals	Energy, protein, invisible fat, thiamine, riboflavin, folic acid, iron, fibre
2.	**Pulses and Legumes :** Bengal gram black gram, green gram, red gram (whole as well as dhals) cow pea, peas, rajmah, soya beans, beans, horse gram and sprouted pulses	Energy, protein, invisible fat, thiamine riboflavin folic acid, calcium, iron, fibre
3.	**Milk and Meat Products :** **Milk :** Milk, curd, skimmed milk, cheese **Meat :** Chicken, liver, fish, egg, mutton	Protein, fat, riboflavin, calcium Protein, fat, vitamin-A, cyanocobalamin
4.	**Fruits and Vegetables** **Fruits :** Guava, tomato, mango ripe, papaya, orange, sweet lime, water melon, grapes, amla **Vegetables : (Green leafy)** : Amaranth, spinach, drumstick leaves, beetroot leaves, coriander leaves, curry leaves, mustard leaves, fenugreek leaves **Other vegetables :** Carrot, onion, brinjal, ladies finger, capsicum, beans, drumstick, cauliflower	Carotenoids, vitamin-C, fibre Carotenoids, riboflavin, folic acid, calcium, iron, fibre Carotenoids, folic acid, calcium, fibre
5.	**Fats and Sugars** **Fats :** Butter, ghee, hydrogenated fat (vanaspathy) gingelly oil, groundnut oil, mustard oil, coconut oil **Sugars :** Sugar, jaggery	Energy, fat, essential fatty acids, fat soluble vitamins Energy, iron in jaggery

Significance of the basic five food group system

The basic five food group system can be used for the following purposes

i) Planning wholesome, balanced menus to achieve nutritional adequacy

ii) Assessing nutritional status – a brief diet history of an individual can disclose inadequacies of food and nutrients from any of the five groups. Based on the assessment, nutrition education can be given to an individual.

Other Food Groups

Researchers have classified foods into various groups. They include Basic Three,Four, Seven and Eleven.

Basic – Three

1. Cereals, oil, sugar, jaggery
2. Pulses, milk, milk products, fish, flesh foods, eggs
3. Greens, vegetables, fruits

Basic – Four

1. Cereals
2. Flesh foods, nuts, legumes, pulses
3. Milk and milk products
4. Vegetables, fruits

Basic – Seven

1. Cereals
2. Flesh foods, nuts, pulses
3. Milk and milk products
4. Green leafy and yellow vegetables
5. Citrus fruits
6. Butter, ghee
7. Sugar, jaggery

Basic – Eleven

1. Cereals
2. Pulses
3. Nuts and oil seeds
4. Vegetables
5. Fruits
6. Milk and milk products
7. Eggs
8. Flesh foods, fish
9. Fats and oils

10. Sugar and jaggery

11. Spices and condiments

Food Pyramid

The food guide pyramid was introduced in 1992 by United States Department of Agriculture (USDA) as a general plan of what to eat each day. The food guide pyramid is a valuable tool for planning a health promoting diet.

The food guide pyramid provides recommendation for the number of daily servings that should be consumed from each of the food groups.

Food guide pyramid (Fig.1.4) clearly represents that cereals should form the major bulk of the diet followed by fruits and vegetables, pulses, milk and meat products and less amount of sugar and oils.

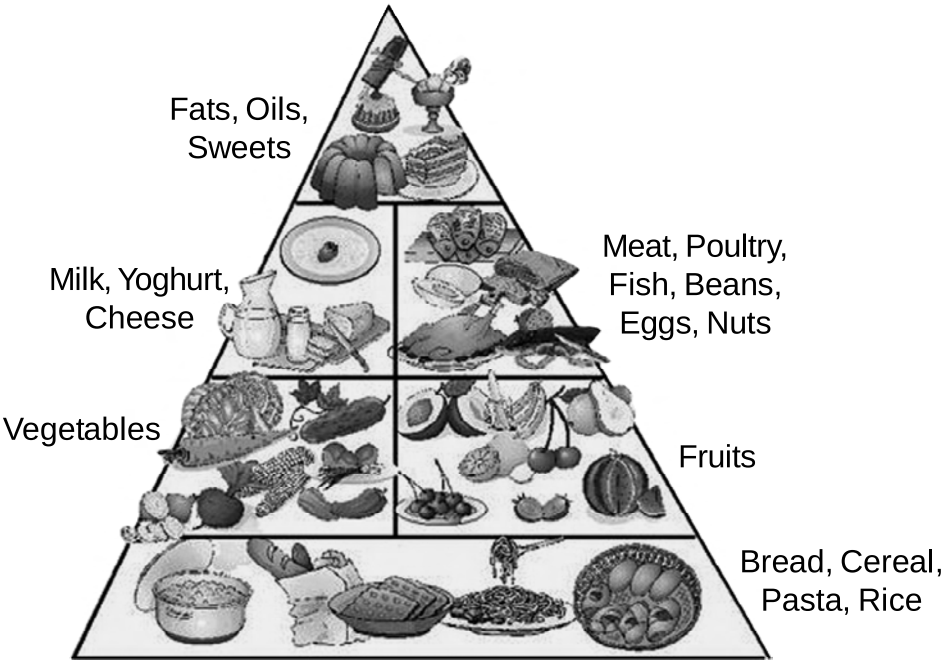


Fig. 1.4 Food Pyramid

By incorporating the principle of balance, variety and moderation an individual can still eat their favourite foods while following the food guide pyramid.

1. Balance :

It means choosing food from different food groups

2. Variety :

This means including different foods within each food group for (eg) consuming a variety of fruits.

3. Moderation :

This means keeping serving sizes reasonable. This involves self control. The portion size of foods for adolescents (13-18 years) is given in Table 1.4.

Table 1.4 : Portion Size of Foods for Adolescents

Food groups	Portion size (g)	Number of portions	
		Girls	Boys
Cereals and millets	30	10	14
Pulses	30	2	2
Milk	100	5	5
Roots and tubers	100	1	2
Green leafy vegetables	100	1	1
Other vegetables	100	1	1
Fruits	100	1	1
Sugar	5	6	7
Fats and oils	5	5	5

[For non-vegetarians substitute one pulse portion with one portion (30 g) of egg/meat/chicken/fish]

Source : Dietary Guidelines for Indians – A Manual , National Institute of Nutrition, ICMR, (1998)

1.4. Recommended Dietary Allowances (RDA)

The requirement of nutrients in the normal diet of an Indian has been recommended by a Committee of Experts from Indian Council of Medical Research (ICMR).

Recommended Dietary Allowances (RDA) are estimates of intakes of nutrients, which individuals in a population group need to consume to ensure that the physiological needs of all subjects in that population are met.

In 1988 an Expert Committee constituted by ICMR modified the reference body weight for Indian adults and RDA in respect of energy, fat, vitamin D and vitamin A. Recommendations on safe intake of fat in terms of both visible and invisible dietary fats were made. For the first time, recommendations for certain trace elements, electrolytes (sodium and potassium), magnesium and phosphorus, vitamin K and vitamin E and dietary fibre were considered.

A number of approaches such as dietary intake of nutrients, growth, nutrient balance, minimal loss of nutrients and nutrient turnover were utilized in arriving at the RDA's.

The RDA of individuals depend upon various factors which are as follows:

1. Weight : The dietary allowances suggested for adults are for a reference man weighing 60 kg and for a reference woman weighing 50 kg. The allowances for calories and proteins and for B-complex vitamins should be increased or decreased depending on the body weight.

2. Age : Adults require more total calories than a child, whereas a growing child requires more calories per kg of body weight than an adult.

3. Sex : Males with high Basal Metabolic Rate (BMR) require more calories than females.

4. Activity : The type of activity also determines the energy requirements. The activities are classified as sedentary, moderate and heavy based on the occupation of an individual. Table 1.5 gives the ICMR classification of activities based on occupation.

5. Physiological stress : Nutrient requirements are increased in conditions of physiological stress such as pregnancy and lactation.

The RDA's are given for various age groups such as adult man and adult woman (for various activities), pregnant and lactating women, infants, children (1-9 years), boys and girls (10-12 years) and adolescents.

Table 1.5: Classification of Activities Based on Occupation

Sex	Activity		
	Sedentary	**Moderate**	**Heavy**
Male	Teacher, Tailor, Barber, Executive, Peon, Postman, Retired personnel, Priest	Fisherman, Basket maker, Potter, Goldsmith, Agricultural labourer, Carpenter, Mason, Coolie, Weaver, Driver	Stone cutter, Mine worker, Wood cutter, Blacksmith
Female	Teacher, Tailor, Executive	House wife, Nurse, Servant maid, Coolie, Agricultural labourer	Wood cutter

Table 1.6 gives the RDA's suggested by ICMR for the different age groups.

Meal Planning

Balanced Diet

A balanced diet is one which contains different types of foods such as cereals, pulses and vegetables in such quantities and proportions that the nutritional requirements are adequately met and a small provision is made for extra nutrients to meet any short duration of leanness.

Factors to be considered in meal planning:

- A balanced diet should provide 60-70 per cent of calories from carbohydrate, 10-20 per cent from protein and 20-25 per cent from fat
- Calorie allowance can be ± 50, while for all other nutrients, minimum Recommended Dietary Allowances (RDA) must be met
- Energy from cereals should not be more than 75 per cent
- At least two cereals should be included in one day's diet (e.g) rice and wheat
- The ratio of cereal protein to pulse protein should be 4:1 to improve protein quality
- Two or three servings of pulses should be taken per day

Table 1.6 : Recommended Dietary Allowances for Indians (Per day)

Group	Particulars	Body weight (kg)	Energy (kcal)	Protein (g)	Fat (g)	Calcium (mg)	Iron (mg)	Vitamin A (μg)	Thiamine (mg)	Riboflavin (mg)	Ascorbic acid (mg)
Man	Sedentary		2425						1.2	1.4	
	Moderate	60	2875	60	20	400	28	600	1.4	1.6	40
	Heavy		3800						1.6	1.9	
Woman	Sedentary		1875						0.9	1.1	
	Moderate	50	2225	50	20	400	30	600	1.1	1.3	40
	Heavy		2925						1.2	1.5	
	Pregnant	50	+300	+15	30	1000	38	600	+0.2	+0.2	40
	Lactation										
	0-6 months	50	+550	+25	45	1000	30	950	+0.3	+0.3	80
	6-12 months		+400	+18					+0.2	+0.2	
Infants	0-6 months	5.4	108/kg	2.05/kg		500		350	55 mg/kg	65 mg/kg	25
	6-12 months	8.6	98/kg	1.65/kg					50 mg/kg	60 mg/kg	
Children	1-3 years	12.2	1240	22			12	400	0.6	0.7	
	4-6 years	19.0	1690	30	25	400	18	400	0.9	1.0	40
	7-9 years	26.9	1950	41			26	600	1.0	1.2	
Boys	10-12 years	35.4	2190	54	22	600	34	600	1.1	1.3	40
Girls	10-12 years	31.5	1970	57			19		1.0	1.2	
Boys	13-15 years	47.8	2450	70	22	600	41	600	1.2	1.5	40
Girls	13-15 years	46.7	2060	65			28		1.0	1.2	
Boys	16-18 years	57.1	2640	78	22	500	50	600	1.3	1.6	40
Girls	16-18 years	49.9	2060	63			30		1.0	1.2	

- At least one medium size fruit should be included per day
- Preferably fruits can be consumed as such (e.g) Orange, Banana, Guava
- Five servings of fruits and vegetables should be included in a day
- The diet should include a minimum of 100 ml milk per day
- Foods rich in fibre should be included (e.g) Sprouted pulses, green leafy vegetables
- One third of the nutritional requirements, at least calories and protein should be met from lunch or dinner.

Essentials of Meal Planning

A major objective of planning meals is to achieve nutritional adequacy along with consideration of other factors such as food cost and economy, acceptability of foods, food habits and religious beliefs, food availability and seasonal variation and food fads.

1. Nutritional Adequacy:

The planned diet should meet the nutritional needs of the individual and the family as a whole. To achieve a balance of nutrients the diet must be planned by including foods from basic five food groups.

Although all the nutrients are important, the requirement for certain nutrients are proportionately higher for certain age groups (e.g) Iron for an adolescent girl. Therefore, identifying rich source of various nutrients within the same food group is required (e.g) rice flakes are rich in iron among cereals.

2. Food cost and Economy:

The expenditure on food is an important part of a family's budget and it is influenced by family size, number of children, age group, activity, special needs of pregnancy, lactation and disease conditions.

The proportionate expenditure on food depends upon the income levels. It increases with decrease in total income. Moreover in the case of low income, a higher proportion is spent on buying staple foods rather than protective foods like milk, vegetables and fruits. Therefore, the aim should be to achieve maximum nutritional benefits at minimum cost. For example, pulse can be used as a source of protein instead of animal foods or less expensive cuts of meat can be used or families can have a small kitchen garden and grow vegetables and fruits to cut down their expenses on this food group and thus exercise economy in meal planning.

For achieving economy in meal planning, the following considerations are important.

- Knowledge of prevailing prices of food items is needed
- Knowledge of proportion of edible portion of different food stuffs is needed as they vary widely. It may be as high as 100 per cent in foods like milk or low as 30-40 per cent in leafy vegetables. This helps to decide the quantity of food to be purchased

- Buying foods from fair price shops and retail outlets
- Bulk purchasing of non perishables
- Using seasonal foods as they are economical
- Minimising nutrient losses during preparation and cooking
- Making proper use of leftovers and the commonly discarded foods. (e.g) green leaves of vegetables like beet root and carrot.

3. Acceptability of foods:

Acceptability of meals is as important as meeting nutritional needs or planning within the budget. To make meals acceptable the following considerations are important.

a. Likes and dislikes : The likes and dislikes of all the family members should be kept in mind.

b. Variety : The meal should have variety in colour, texture, taste and flavour for better acceptability. Variety can be achieved by

i) Selecting foods from each food group

ii) Including a variety of vegetables to add colour

iii) Avoiding repetition of the same food in different meals as well as in the same meal in a different form

iv) Using different methods of cooking such as baking, boiling, frying to bring variety in texture.

v) Using various garnishes and accompaniments.

4. Food habits and religious beliefs

Religious and socio cultural beliefs influence the choice of food. Certain foods are prohibited by certain religions. Also the socio cultural factors either promote or prohibit the intake of particular foods in different families and communities.

5. Food availability and seasonal variation

As far as possible seasonal and locally available foods should be used. Vegetables and fruits in season will be available at reasonable cost.

6. Food fads

Wrong notions and beliefs regarding consumption of food is prevalent in different communities, many of which are baseless and may deprive an important nutrient source. For example, fads like milk and fish should not be included in the same meal. Such food fads need to be discouraged.

7. Portion sizes

While planning and preparing a meal, it must be ensured that the quantity prepared be easily consumed by the person of the given age, sex and activity. At the same time the quantity must meet their nutritional needs. These quantities are referred as “one serving portion” or “portion sizes”.

Steps in Meal Planning : The following steps may be adopted in planning meals.

1. Recommended Dietary Allowances (RDA)

To plan a balanced diet the first step is to know the Recommended Dietary Allowances for different age groups.

2. Food List

The next step is to prepare a food list which contains the quantities of various foods from the food groups to be included in the diet so that it is balanced and can meet the RDA. This can be done by

i) Selecting foods from all the five food groups.

ii) Deciding the quantities of the selected foods as multiples of portion sizes.

The number of portions of various food groups to be included in planning a balanced diet for adults is given in Table 1.4. For example the quantity of cereals and pulses to be included per day for adult man doing sedentary work is 420g and 60g respectively.

A sample meal plan for an adult man doing sedentary activity is given in Table 1.7 and 1.8.

Table 1.7 : Balanced Diet for Adults doing Various Activities

Foods	Portion size (g)	Activity					
		Sedentary		Moderate		Heavy	
		Man	Woman	Man	Woman	Man	Woman
Cereals & Millets	30	14	10	16	12	23	16
Pulses	30	2	2	3	2.5	3	3
Milk	100	3	3	3	3	3	3
Roots and Tubers	100	2	1	2	1	2	2
Green leafy vegetables	100	1	1	1	1	1	1
Other vegetables	100	1	1	1	1	1	1
Fruits	100	1	1	1	1	1	1
Sugar	5	5	4	8	5	11	9
Fats and oils (visible)	5	4	4	7	6	11	8

For non-vegetarians substitute one pulse portion with one portion (30g) of egg/meat/chicken/fish.

Source: Dietary Guidelines for Indians – A manual, NIN, ICMR, Hyderabad, 1999.

Table 1.8 : Sample Meal Plan for an Adult Man (Sedentary)

Meal Time	Food Group	Amount (g)	Menu	Servings
Breakfast	Milk Sugar Cereals Pulses	100 15 70 20	Milk (Tea or Coffee) Idli Chutney	1 cup 4 ¼ cup
Lunch	Cereals Pulses Vegetables Milk	15 20 150 50	Rice Pulkas Dhal Vegetable curry Vegetable – salad Curd	2 cups 2 nos ½ cup ¾ cup ½ cup ¼ cup
Tea	Milk Sugar Cereals	50 10 50	Tea – Ragi pakoda	1 cup ½ cup
Dinner	Cereals Pulses Vegetables Vegetables Fruit Milk	150 20 200 100 100 50ml	Chappathi Dhal Vegetable – salad Vegetable curry Seasonal fruit Milk	3 nos ½ cup ½ cup ¾ cup 1 medium ½ cup

1 cup = 200ml Use 20g visible fat per day.

Note: For non vegetarians substitute one pulse portion with one portion of egg/ meat/chicken/fish.

1.5. Food preparation

It is an important step in meeting the nutritional needs of the family. Food has to be pleasing in appearance and taste for consumption. Foods like fruits, vegetables and nuts can be eaten raw but most foods are cooked to bring about desirable changes. The process of subjecting food to the action of heat is termed as cooking.

Objectives of cooking

1. Cooking sterilizes food - The growth of bacteria decreases rapidly at a temperature above 49^0C. Hence, food is made safe for consumption.
2. Cooking softens the food - Cooking softens the connective tissues of meat and the coarse fibre of cereals, pulses and vegetables so that the digestion time is reduced and the gastro intestinal tract is less subjected to irritation.
3. Cooking improves palatability and quality of food – Palatability and qualities like appearance, colour, flavour, texture and taste of food are enhanced while cooking.
4. Introduces variety – Different dishes can be prepared with the same ingredients, (eg) Rice can be made into biriyani and kheer.

5. Increases food consumption – Cooking brings about improvement in texture and flavour thereby increases the consumption of foods.
6. Increases availability of nutrients – For example, raw egg contains a B complex vitamin biotin. But in raw egg, a chemical compound namely avidin binds with biotin making it unavailable to the body. By cooking, avidin gets denatured and biotin is made available.

Need for Measuring ingredients

Quantity food production depends upon correct weights and measures. In order to obtain a standard product with a standard yield it is essential that foods should be weighed and measured accurately. A set of scales, measuring jugs, standard measuring cups and spoons must be used in every kitchen.

Methods of measuring ingredients

a. Flour : This is the most difficult ingredient to be measured. It has to be sifted before being measured. Flour can be measured by levelling or tapping and levelling. Tapping of flour will show more amount of flour than levelling. Levelling can be done using a knife edge or spatula.

b. Sugar : Usually white or brown sugar is sifted before measuring. White sugar is filled into a measuring cup and levelled with the edge of a knife. Brown sugar on the other hand should be packed into the measuring cup, tightly by shaking the cup when the sugar is filled.

c. Fats : Fats are either solid or liquid. (e.g) Dalda which is solid must be pressed into the measuring cup then levelled with the edge of a knife. Liquid fats must be directly poured into a measuring cup upto the desired level. Care should be taken while removing the contents from the cup so that nothing is left sticking to the sides of the cup.

d. Liquids : Liquids are measured in a graduated standard measuring cup. The cup should be placed on a levelled surface before the liquid is poured. If any froth is formed at the top, it should be allowed to settle before taking the measurement. Syrup must be poured into a measuring cup or a spoon and checked for the mark at the eye level. Measuring cup is used for less than one fourth of the cup.

e. Powdered foods : Milk powder, baking powder, salt and chilly powder must be stirred to break all the lumps. Then dry spoon is dipped into the powder and taken up. The excess is levelled with the help of the edge of a knife.

f. Egg : Most recipes give the number of eggs required. In such cases medium size egg is used. The eggs are beaten, poured into the measuring cup and then measured.

Preparation of food

For the preparation of food one must know the ingredients needed, its quantity and the method of weighing. When the ingredients are in correct proportion, the resultant product will be of good quality. The techniques of preparation, method of using graduated equipment, method of measuring and the commonly used abbreviations should be known for the preparation of food.

Abbreviations used

Cubic centimeter	-	cc
Cup	-	C
Fluid	-	fl
Gallon	-	gal
Millilitre	-	ml
Ounce	-	oz
Pint	-	Pt
Quart	-	qu
Gram	-	g
Kilogram	-	kg
Microgram	-	mcg
Milligram	-	mg
Pound	-	lb
Table spoon	-	Tbsp
Teaspoon	-	tbsp
Standard spoon	-	S
Hour	-	hr
Minute	-	min.
Second	-	sec.

Measuring units

Smaller quantity of liquid is measured with spoons. Home Science Association of India (HSAI) has introduced standard cups and spoons to measure fluid and other food ingredients, both dry and wet. Ingredients are to be measured with only one cup. First measure the dry ingredients and then wet ingredients.

Conversion Table

Standard cup	Standard spoon	Quantity (ml)
1	50	250
4/5	40	200
3/5	30	150
1/2	25	125
2/5	20	100
1/5	10	50

Equivalents

Measures	Equivalents
1 cup	16 tsps or ½ pint
2 cups	1 pint
4 cups	1 quart
4 quarts	1 gallon
1 litre	1000 cc

Weight : Weighing is mostly done using metric system and so gram weight is considered as the basic unit. Graduated measuring cups to measure dry ingredients are available as 1, ½, 1/3 and 1/4 cups.

Cups to measure liquids: Graduated measurements are indicated in glass and plastic and measuring cups. Measuring cups are available as 200 ml, 150 ml and 100 ml.

Measuring spoons: Ingredients less than ¼ cup can be measured using spoons (¼ tsp, ½ tsp, 1 tsp. and 1 Tbsp).

Preliminary preparations : Preliminary preparations of food include cleaning, peeling, cutting, grating, sieving, filtering, soaking, blanching, grinding, drying, sprouting and fermenting. The following steps will help to conserve nutrients.

a) Foods should be washed well before cooking

b) Vegetables and fruits should be washed thoroughly before cutting.

c) Vegetables should be cut into large pieces to prevent loss of nutrients due to oxidation.

d) Soaking of cut vegetables in water for longer periods should be avoided.

e) Batters should be allowed to ferment for 12 hours overnight.

f) Grains or grams should be soaked for 12 hours and the water is drained and left in a closed container for 8 hours for germination.

g) Fermentation and germination improves digestibility and increases nutrients such as B-complex vitamins and vitamin C.

Methods of Cooking : Heat is transferred to the food during cooking by conduction, convection, radiation or microwave energy. Cooking takes place by moist and dry heat. Moist heat involves water and steam, whereas dry heat involves air or fat.

Classification of Cooking Methods :

Cooking Methods

Moist heat	Dry heat	Combination methods	Other methods
a) Boiling	a) Roasting	a) Braising	a) Microwave cooking
b) Stewing	b) Grilling		b) Solar cooking
c) Steaming	c) Toasting		
d) Pressure cooking	d) Baking		
e) Poaching	e) Sauteing		
f) Blanching	f) Frying		

I. Moist heat methods

a) Boiling:

Boiling is a method of cooking food by just immersing them in water at 100^{0}C and maintaining the water at that temperature till the food becomes tender. Rice, egg, dhal, meat, roots and tubers are cooked by boiling.

Merits

1. Simple method. Does not require special skill and equipment.
2. Uniform cooking can be achieved.

Demerits

1. Continuous excessive boiling leads to damage in the structure and texture of food
2. Loss of heat labile nutrients such as B and C vitamins will be more if the water is discarded.
3. Boiling takes more time to cook food and fuel may be wasted
4. Water soluble pigments may be lost which may affect the colour of foods.

b) Stewing

It refers to the simmering of food in a pan with a tight fitting lid using small quantities of liquid to cover only half of the food. This is a slow method of cooking. The liquid is brought to boiling point and the heat is reduced to maintain simmering temperature (82^{0}C – 90^{0}C). The food above the liquid is cooked by the steam generated within the pan. Apple, meat, root vegetables and legumes are usually stewed.

Merits

1. Loss of nutrients is avoided since the water used for cooking is not discarded.
2. Flavour of food is retained.

Demerits

1. This method is time consuming and there is wastage of fuel.

c) Steaming

It is a method of cooking food in steam generated from vigorously boiling water in a pan. The food to be steamed is placed in a container and is not in direct contact with the water or liquid. Idli, custard and idiappam are prepared by steaming. Vegetables can also be steamed.

Merits

1. Less chance of burning and scorching
2. Texture of food is better as it becomes light and fluffy (eg.) Idli.
3. Cooking time is less and fuel wastage is less
4. Steamed foods like idli and idiappam contain less fat and hence easily digested and good for children, aged persons and patients who need therapeutic diets
5. Nutrient loss is minimized.

Demerits

1. Steaming equipment is required
2. This method is limited to the preparation of selected foods.

d) Pressure cooking

When steam under pressure is used, the method is known as pressure cooking and the equipment used is pressure cooker. In this method the temperature of boiling water can be raised above $100^{o}C$. Rice, dhal, meat, roots and tubers are usually pressure cooked.

Merits

1. Cooking time is less compared to other methods.
2. Nutrient and flavour loss is minimized
3. Fuel and time are conserved as different items can be cooked at the same time
4. Less chance for burning and scorching
5. Constant attention is not necessary.

Demerits

1. The initial investment may not be affordable to everybody
2. Knowledge of the usage, care and maintenance of cooker is required to prevent accidents.
3. Careful watch on the cooking time is required to prevent overcooking.

e) Poaching

This involves cooking in minimum amount of liquid at temperatures of 80°C - 85°C that is below the boiling point. Egg and fish can be poached.

Merits

1. No special equipment is needed
2. Quick method of cooking and therefore saves fuel
3. Poached foods are easily digested since fat is not added.

Demerits

1. Poached foods may not appeal to everybody as they are bland in taste.
2. Food can be scorched if water evaporates due to careless monitoring.
3. Water soluble nutrients may be leached into the water.

f) Blanching

In some of the preparations, it is often necessary only to peel off the skin of fruits and vegetables without making them tender. This can be achieved by blanching. In this method, food is dipped in boiling water for five seconds to two minutes depending on the texture of the food. This helps to remove the skin or peel without softening the food.

Blanching can also be done by pouring enough boiling water on the food to immerse it for sometime or subjecting the foods to boiling temperature for a short period and then immediately immersing in cold water. This process causes the skin to become loose and can be peeled off easily.

Merits

1. Peels can be easily removed to improve digestibility.
2. Enzymes are destroyed that bring about spoilage
3. Texture can be maintained while improving the colour and flavour of food.

Demerits

Loss of nutrients if cooking water is discarded.

II. Dry Heat Methods

a) Roasting

In this method food is cooked in a heated metal or frying pan without covering it (eg) groundnut.

Merits

1. Quick method of cooking
2. Improves the appearance, flavour and texture of the food
3. Spices can be easily powdered when they are roasted.

Demerits

1. Food can be scorched due to carelessness.
2. Roasting denatures proteins and reduces their availability

b) Grilling

Grilling or broiling refers to the cooking of food by exposing it to direct heat. In this method, food is placed above or in between a red hot surface. Papads, corn, phulkas and chicken can be prepared by this method.

Merits

1. Enhances flavour, appearance and taste of the product.
2. It requires less time to cook
3. Minimum fat is used

Demerits

Constant attention is required to prevent scorching or burning.

c) Toasting

This is a method where food is kept between two heated elements to facilitate browning on both sides. Bread slices are toasted by this method.

Merits

1. Easy and quick method
2. Flavour of food is improved

Demerits

1. Special equipment is required
2. Careful monitoring is needed to prevent scorching or burning

d) Baking

In this method, the food gets cooked in an oven. The temperature range maintained in an oven is 120^oC – 260^oC.

The food is usually kept uncovered in a container greased with a fat coated paper. Bread, cake, biscuits, pastries and meat are prepared by this method.

Merits

1. Baking provides a unique baked flavour to foods
2. Foods become light and fluffy (eg) cakes, custard, bread
3. Certain foods can be prepared only by this method – bread, cakes
4. Uniform and bulk cooking can be achieved (eg.) bun, bread
5. Flavour and texture are improved
6. Variety of dishes can be made

Demerits

1. Special equipment like baking oven is required.
2. Baking skills are necessary to obtain a product with ideal texture, flavour and colour characteristics
3. Careful monitoring is needed to prevent scorching or burning.

e) Sauteing

Sauteing is a method in which food is lightly tossed in little oil just enough to cover the base of the pan. The pan is covered with a lid and the flame or intensity of heat is reduced. The food is allowed to cook till tender in its own steam. The food is tossed occasionally, or turned with a spatula to enable all the pieces to come in contact with the oil and get cooked evenly.

The product obtained by this method is slightly moist and tender but without any liquid or gravy. Foods cooked by sautéing are generally vegetables which are used as side dishes in a menu. Sauteing can be combined with other methods to produce variety in meals.

Merits

1. Takes less time
2. Simple technique
3. Minimum oil is used

Demerits

Constant attention is needed as there is a chance of scorching or burning.

f) Frying

In this method, the food to be cooked is brought into contact with larger amount of hot fat. When food is totally immersed in hot oil, it is called deep fat frying. Samosa, chips, pakoda are examples of deep fat fried foods. In shallow fat frying, only a little fat is used and the food is turned in order that both sides are browned. (eg). Omelette, cutlets, parathas.

Merits

1. Very quick method of cooking
2. The calorific value of food is increased since fat is used as the cooking media.
3. Frying gives a delicious flavour and attractive appearance to foods.
4. Taste and texture of foods are improved.

Demerits

1. Careful monitoring is required as the food easily gets charred when the smoking temperature is not properly maintained.
2. The food may become soggy due to too much oil absorption
3. Fried foods are not easily digested
4. Repeated use of heated oils will have ill effects on health.

III. Combination of Cooking Method

Braising

Braising is a combined method of roasting and stewing in a pan with tight fitting lid. Flavourings and seasonings are added and food is allowed to cook gently.

Food preparations prepared by combination methods are

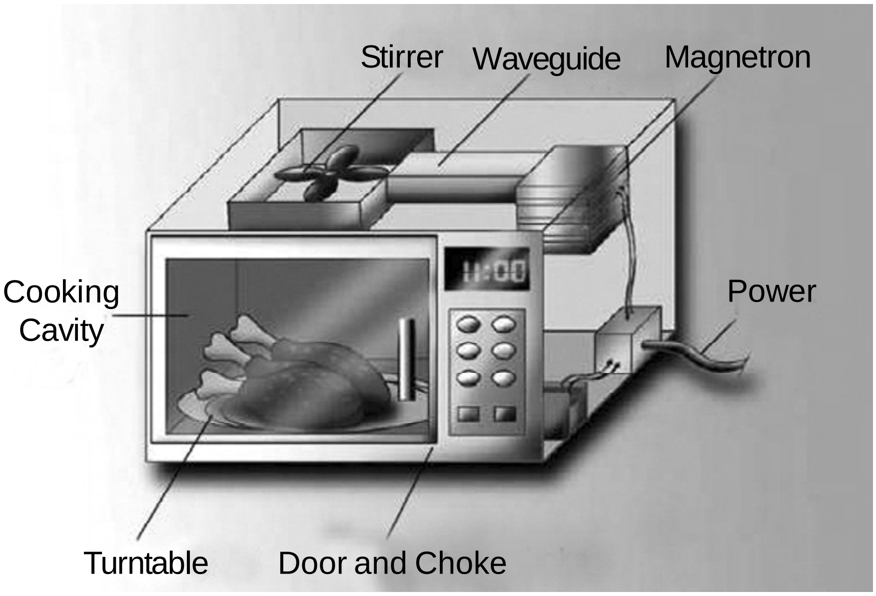
Uppuma	-	Roasting and boiling
Cutlet	-	Boiling and deep fat frying
Vermicelli payasam	-	Roasting and simmering

IV. Other Methods

a) Microwave Cooking

Microwaves are electromagnetic waves of radiant energy with wave lengths in the range of 250 x 10^6 to 7.5 x 10^9 Armstrong. The most commonly used type of microwave generator is an electronic device called magnetron, which generates radiant energy of high frequency. A simple microwave oven consists of a metal cabinet into which the magnetron is inserted. The cabinet is equipped with a metal fan that distributes the microwaves throughout the cabinet. Food placed in the oven is heated by microwaves from all the directions.

Moist foods and liquid foods can be rapidly heated in such ovens. Food should be kept in containers made of plastic, glass or chinaware and not metallic containers. These containers are used because they transmit the microwaves but do not absorb or reflect them.



Microwave Oven

Merits

1. It is a quick method, 10 times faster than conventional method. Hence loss of nutrients can be minimized.
2. Only the food gets heated and the oven does not get heated
3. Food gets cooked uniformly
4. Leftovers can be reheated without changing the flavour and texture of the product
5. Microwave cooking enhances the flavour of food because it cooks quickly with little or no water.

Demerits

1. Bakery products cooked by microwaves do not get a brown surface
2. Microwave cooking cannot be used for simmering, stewing or deep fat frying
3. Flavour of all the ingredients do not blend well as the cooking time is too short.

b) Solar Cooking

Solar cooking is a very simple technique that makes use of sunlight or solar energy which is non-conventional source of energy. Solar cooker consists of a well insulated box which is painted black on the inside and covered with one or more transparent covers.

The purpose of these transparent covers is to trap heat inside the solar cooker. These covers allow the radiation from the sun to come inside the box but do not allow the heat from the hot black absorbing plate to come out of the box. Because of this, temperature upto 140^0C can be obtained which is adequate for cooking.

Solar Cooker

Merits

1. Simple technique and requires no special skill.
2. Cost effective as natural sunlight is the source of energy
3. Original flavour of food is retained
4. There is no danger of scorching or burning
5. Loss of nutrients is minimum as only little amount of water is used in cooking

Demerits

1. Special equipment is needed
2. Slow cooking process
3. Cannot be used in the absence of sunlight, during rainy season, late evenings and at night.

1.6 Fast Foods

Modern foods can be grouped into two categories.

1. Convenience foods 2. Fast foods

1. Convenience foods are the result of modern technological advances in the field of food processing, preservation techniques and the invention of various new food addtitives. The list comprises of :

a. Instant dry mixes such as those of gulab jamun, pulao, kitchadi, biriyani, idli, dosa, noodles, soups and so on.

b. Canned products, which need only to be warmed for a few seconds in the microwave oven before being served. For example: Alu mutter, paneer mutter, palak paneer.

c. Frozen foods are available in the market in a wide variety, such as all types of vegetables, chicken, meat, fish and their products.

d. Prepared or fabricated foods such as laddos, mysore pak, jilabi are our traditional preparations. Soybean is today used to make texturized products, which are similar to meat products and are popularly known as meat analogs : (eg): nutri nuggets, nutrela, soya chunks.

2. Fast foods: These foods are usually less healthy than other kinds of foods. This usually includes frying, which makes the food very fatty. Our indigenous fast foods have existed along with the multitude of cuisines. In our country there is no Indian who has not heard of dosa, idli, chat, chole, bhatura, parathas, kababs, tandoori preparations, samosas, sweets, pakoras, pavbajji and vadapav.

The American and Chinese fast foods owe their popularity particularly to the impressionalbe teenage crowd due to the eight Fs.

1. Family: The products offered by the fast food restaurants cater to the tastes of young and old alike. Hence a visit to the nearest restuarant is a family outing enjoyed by all.

2. Fast: The service is quick from the time food is ordered, especially when compared to the three course or five course meals eaten in restaurants. Many a time it is self-service.

3. Fried: Several items are fried, which most people like (eg) french fries, potato chips.

4. Filling: Several fast foods are calorie dense and have a high satiety value. Vegetable

burgers with French fries accompanied with an aerated drink, followed by a milk shake or icecream is sufficient to satisfy one's hunger.

5. Fresh: Due to a large turnover, the foods served are fresh. There are a few salad vegetables which need to be freshly cut prior to being used.

6. Fantasy: The customer likes to try out new concepts, which adds to the excitement and the fantasy of the dish. Savoury pancakes and salsa are some of the latest additons to fast foods.

7. Fordism : Most fast food vendors have the capacity to machine produce a fast food that is well standardised and with almost no variation in it from batch to batch.

8. Franchising: The availability of the fast food in convenient places such as drive-in restuarants, malls, department stores and airports has made it popular. The vending of the food at easily available location adds to its popularity.

Effects of fast foods:

Nutritionally, fast foods contribute to a number of nutrients, mainly calories, fats (especially saturated fats), refined carbohydrates, proteins and sodium. Most of the fast foods are a concentrated source of calories since they contain large amounts of carbohydrates and fats. Many of them are fried and contain visible fats. Others may contain invisible fat in the form of cheese, cream, eggs, various dressings and toppings made from oils and eggs.

The fats in many fast foods are of the saturated variety since animal fats may dominate. These fats are essential for stored energy in our body but PUFA must also be used in equal amounts. Animal fats are rich source of cholesterol (with the exception of fish). It is a known fact that cholesterol is one of the principal causative factors of atherosclerosis.

Fast foods contain salt in high concentrations, particularly the spiced, fried and animal-based products. Chinese food is rich in sodium as well as monosodium glutamate. This latter substance, which is said to be a flavour enhancer, is also responsible for the "Chinese restaurant syndrome" characterized by head-ache, dizziness, nausea and other allergic symptoms. Sodium is directly held responsible for hypertension. Generally fast foods are a rich source of sodium. They are also low in fibre, unless a large proportion of raw or cooked vegetables, whole legumes, unrefined flour and fruits are included.

Besides, they may contain a number of additives like artificial colours, flavours, artificial sweetners, flavour enhancers, flavour modifiers and gelling agents. Not only do these additives affect our systems in a long run but they are also responsible for unexplained reactions in several people.

Experiments done by pediatricians concluded that fast-food consumption was prevalent in both males and females, all racial / ethnic groups and all regions of the country. Children who ate fast food also ate less fibre, milk, fruit and non-starchy vegetables. Consumption of fast food by children seems to have a negative effect on the individual's diet, in ways that could significantlly increase the risk of obesity. Therefore consumption of fast food should be avoided especially among children.

Questions

SECTION - A

I. A. Choose the correct answer

1. Body building foods are ....
   a) Vintamins and minerals b) Proteins c) Carbohydrate
2. Cereals are rich in ....
   a) Proteins b) Fats c) Carbohydrates
3. RDA for Indians are recommended by the experts committee from
   a) WHO b) ICMR c) UNICEF
4. Weight of Indian reference man is ....
   a) 60 kg b) 40 kg c) 80 kg
5. Weaver is doing .... type of activity
   a) Sedentary b) Moderate c) Heavy
6. A balanced diet for an adult should contain .... g of protein per day
   a) 60-70 b) 10-20 c) 20-25
7. The abbreviation used for measuring fluid is
   a) Gal b) cc c) fl
8. One kilogram weight is equivalent to
   a) 100 g b) 1000g c) 1000mg
9. An example for dry heat method
   a) Roasting b) Steaming c) Frying
10. Chinese restaurant syndrome is caused due to the consumption of
    a) Home foods b) Fast foods c) Convenience foods

B. Answer in one or two sentences

1. Give any two examples for protective foods
2. Write the nutrients present in milk
3. Write the types of activities
4. Write the methods of measuring flour
5. Write any two moist heat methods.
6. What are the sizes available in measuring cups?
7. Write the basic three food group.
8. Give any two examples for braising method of cooking?
9. Write the name of the device used in microwave cooking.
10. Write some of the nutrients present in fast foods.

SECTION - B

II. Write in five lines

1. Define health and food.
2. Define nutrition and nutrients.
3. Write any four reasons for malnutrition.
4. What are the differences between under and over nutrition?
5. List the food groups in basic seven.
6. Define RDA.
7. How do you measure liquids and fats?
8. What are the merits and demerits of pressure cooking?
9. What are canned and prepared foods?
10. Write on sauteing.

SECTION - C

III. Write in one page

1. Write in detail about the functions of food.
2. Explain ICMR five food groups.
3. Draw a food pyramid and explain.
4. Define balanced diet and enumerate the factors to be considered in meal planning.
5. Write the factors which affect the RDA of an individual.
6. Explain the objectives of cooking.
7. Write about the classification of methods of cooking.
8. Write a short note on microwave cooking.
9. Draw the virtuous and vicious cycle of nutrition
10. Explain the effects of fast foods.

SECTION - D

IV. Write in detail

1. Tabulate the signs of well nourished and malnourished.
2. Explain the essentials of meal planning.
3. Explain the methods of measuring various ingredients.
4. Discuss on the following topics :

   (a) Poaching (b) Baking (c) Frying (d) Solar cooking
5. Explain on the 8 F's of fast foods.

2. NUTRITION

Basic Knowledge of Important Nutrients

Nutrients are the constituents in food that must be supplied to body in suitable amounts. These include carbohydrates (starch), fats, proteins, vitamins and minerals. These nutrients are essential for growth, development and maintenance of good health throughout life. Daily intake of balanced diet helps to satisfy the individual nutrient requirement. Balanced diet is the one which contains the essential nutrients in such quantities and proportions that the nutritional requirements are adequately met.

2.1. Energy

Energy is the capacity to do work. The energy to perform work is derived from carbohydrate, fat and proteins in the diet. The source of energy in diet varies depending on agricultural, cultural, social and economic factors. The body needs energy for maintaining body temperature, to meet the metabolic changes for growth and activities and to maintain health.

Units of Energy

The unit of energy is “Joule”. Since joule is too small, for practical nutrition kilojoule (KJ) is used. Kilojoule has replaced kilocalorie, sometimes written as “Calorie”

1 k.calorie = 4.18 KJ

A kilocalorie is the amount of heat required to raise the temperature of one litre of water to 1 degree celcius. A calorie is defined as the amount of heat required to raise the temperature of 1g of water through 1 degree celcius. In estimating the calorific value of foods, kilocalorie or calorie is used as the basic unit in nutrition.

Factors affecting energy requirements :

Energy requirements vary from person to person. Factors that affect the energy requirements are the size and shape of the body, age, occupation etc.

1. Size and shape of the body :

Tall and thin people have greater energy requirements than short and round people. Amount of fat in one’s body also affect the energy requirements.

2. Age :

The energy expenditure of humans may vary with age because of changes in body weight, change in the basal metabolic rate, physical activity and prevalence of disease and disabilities.

3. Body movements :

The energy required for the normal body processes such as the heart beat, respiration and many other activities of the body cells can be measured as basal metabolism. Any added movement like sitting up or talking needs more energy expenditure. The greater the physical activity, the more the energy requirement of the body.

4. Basal metabolism :

In order to compare the energy requirement of different people "Basal metabolosim" is measured. Food is a stimulus to metabolism. Basal metabolism is measured when the person is lying quite and relaxed and 12 to 18 hours after the last meal. Basal metabolism is the minimum amount of energy needed by the body at the post absorptive state, physical and emotional rest.

5. Occupation :

Occupation is another major factor that influences the energy requirement. It is generally assumed that one spends eight hours each in bed, at work and in non-occupational activities. Based on this the energy expenditure of men and women can be calculated.

The energy required during the eight hours at work is determined by occupation and to a very small extent by the individual. A classification of the different occupations by level of activity is given. Sedentary work, moderate work and heavy work and the details are given in Table 2.1.

Table 2.1 : Energy Expendeiture per hour according to Occupation

Classification	Man (kcal)	Woman (kcal)
Light work	140	100
Moderate work	175	125
Heavy work	240	175
Exceptionally active work	300	225

Basal Metabolic Rate:

Basal Metabolic Rate (BMR) is a measure of the energy required for the activities of resting tissue. The basal metabolic rate can be measured directly from the heat produced (using a respiration calorimeter and metabolic chamber) or indirectly from oxygen intake and carbondioxide released when the subject is at rest.

Factors affecting Basal Metabolic Rate (BMR)

The factors affecting Basal Metabolic Rate are listed in Table 2.2.

Table 2.2 : Factors Affecting Basal Metabolic Rate (BMR)

S.No.	Factor	Effect on BMR
1.	Body composition	The more lean body mass higher is the BMR. This is due to greater metabolic activity in these tissues when compared to bones and fat. Men with a high proportion of muscle mass or lean body mass have a higher BMR than women
2.	Fever	Fever raises the BMR. There is a 7% increase in BMR for each degree rise in temperature in farenheit.
3.	Stress	Physical and mental stress raises BMR
4.	Smoking and Caffeine	Increases the BMR
5.	Hyperthyroidism (Oversecretion of thyroxin)	The basal metabolic rate is elevated as much as 50-70%.
6.	Growth	In children and pregnant women the BMR is higher
7.	Pregnancy	During the last trimester of pregnancy. BMR is increased by 15-25% as there is an increase in muscle mass of uterus, size of mammary gland, foetal mass and placenta, cardiac work and respiratory rate
8.	Fasting / starvation	Lowers BMR
9.	Hypothyroidism (Under secretion of thyroxin)	The BMR is decreased by 30%
10.	Age	Lean body mass diminishes with age slowing the BMR. In tall people the BMR is higher.
11.	Undernutrition	Prolonged undernutrition lowers the BMR

2.2. (a) Carbohydrates: Carbohydrates present in the diet are an important source of energy. Carbohydrates are sugars or polymers of sugars such as starch that can be hydrolysed to simple sugars.

Carbohydrates are classified into three types according to the sugar molecules present.

Carbohydrates

Monosaccharides (Simple sugars - glucose, fructose)

Disaccharides (Double sugars - sucrose, lactose)

Poly saccharides (More sugars - starches, Dextrin)

Functions of carbohydrates

1. The body uses carbohydrates as a source of energy - one gram of carbohydrate provides 4 kilocalories.
2. Carbohydrates are the major source of energy for muscular work
3. The main source of energy for the central nervous system is glucose
4. The body mainly uses carbohydrates as a source of energy. In case of carbohydrate deficiency, breakdown of tissue protein will take place to yield energy. Adequate intake of carbohydrate will prevent tissue protein break down. This is called protein sparing action of carbohydrates.
5. Carbohydrates have special functions to perform in the liver. They include detoxifying action and a regulating action on protein and fat metabolism.
6. The heart muscle mainly uses glucose as a source of energy.
7. Excess of calories is stored in the form of fat in the adipose tissue.
8. Consumption of indigestible polysaccharides of fibre prevents constipation and reduces the incidence of heart diseases, diabetes mellitus and colon cancer.

Sources of Carbohydrates: Cereals and millets, sugar, jaggery, dried fruits, nuts and oil seeds, vegetables like potato, tapioca, yam and green plantain.

Deficiency diseases : Underweight, weight loss, reduced energy to do work.

Fibre

Dietary fibre is the name given collectively to indigestible carbohydrates present in foods. This includes cellulose, hemicellulose and pectins which are components of skins of fruits, covering of seeds and the structural part of edible plants and are usually referred to as 'fibre'. Some of these are water soluble and others are water insoluble.

Dietary fibre is not digested by the enzymes of the stomach and small intestine, whereas most of the other carbohydrate like sugars and starch are digested and absorbed. Dietary fibre has the property of holding water and swell and behave like a sponge as it passes through gastro intestinal tract.

Functions:

It performs two very important functions.

(i) Providing the faecal bulk

(ii) Stimulating large intestine for easy movements.

(i) Providing the faecal bulk : Faecal bulk is made up of cellulose besides indigestible substances, bacterial cells and water may also be present. Cellulose binds the undigested and excretory matter. It absorbs water and thus increases intestinal bulk. This prevents hardening of stools and promotes laxation. Constipation, which is a very common disorder of daily life, can easily be prevented if adequate quantity of fibre is included in the daily diet.

(ii) Stimulating large intestine peristalsis : Fibre is essential for the movement of the bowel as it stimulates the large intestines. When the large intestines contract, the faecal matter is pushed and the indigested food and other excretory matter is then eliminated.

Uses of Fibre

1. Fibre adds bulk to the diet and prevents constipation and increases transit time in the gut.
2. Dietary fibre is known to be associated with reduced incidence of coronary heart disease. The mechanism of its action is attributed to its binding to bile salt and thus preventing its reabsorption and in reducing cholesterol level in circulation.
3. Fibre is also known to reduce blood glucose levels and are often recommended for the management of certain types of diabetes.
4. Dietary fibre plays a role in reducing the risk of colon cancer.
5. Fibre also helps in reducing weight and therefore plays a role in obesity control.

Daily Requirements: It is suggested that a daily intake of 40g of dietary fibre is desirable.

Food Sources : Whole grain cereals, whole pulses and legumes, fruits and vegetables.

(b) Proteins: Protein is an important nutrient. Dietary protein performs mainly the three functions of nutrients such as growth, maintenance and repair of body tissues. It regulates the key processes within the body and only excess protein can be used as a source of energy.

Functions of Proteins

1. Proteins are required for the growth, repair and maintenance of tissues.
2. It is needed for the formation of essential body components
3. It regulates the water balance in the body
4. It helps in the transport of nutrients
5. It is required for the maintenance of appropriate pH
6. It is also a source of energy. One gram of protein provides 4 kilocalories.
7. It helps to fight against disease.
8. It helps in detoxifying action

Sources of Proteins : Meat, fish, poultry, egg, milk and milk products, legumes and pulses like redgram, greengram and soyabean, groundnut, nuts and oil seeds.

Deficiency diseases : Kwashiorkor and Marasmus

Symptoms

Kwashiorkor Child

Kwashiorkor : Retarded growth, loss of appetite, mental apathy, oedema, diarrhoea, pellagra, skin lesions and colour change of the hair, moon face, fatty liver, anaemia.

Marasmus : Growth retardation, loss of subcutaneous fat, muscle wasting, loss of weight and the individual becomes very thin.

Marasmic Kwashiorkor : Combination of symptoms of both Kwashiorkor and Marasmus are found in Marasmic Kwashiorkor.

(c) Fats : The term lipid or fat is applied to a group of naturally occurring substances characterized by their insolubility in water. The lipids present in the diet and human body include triglycerides, phospholipids and cholesterol.

Functions of Fats:

1. Fats are a concentrated source of energy. One gram of fat provides 9 kilocalories.
2. Fat is essential for the absorption of fat soluble vitamins like A,D,E and K.
3. Fat improves the palatability of meals and gives a satiety value (ie) feeling of fullness in the stomach.
4. They act as insulators against heat and cold.
5. Fats are deposited in adipose tissue and thus act as a reserve source of energy during starvation and illness.
6. They protect vital organs in the body by forming a subcutaneous fat layer.
7. They are essential constituents of the membrane of every cell.
8. Vegetable fats provide essential fatty acids which are needed for structure and function of cells.
9. Phospholipids are present in the plasma in combination with proteins as lipoproteins which are involved in the transport of fat and cholesterol.
10. Phospholipids are present in large amounts in the nervous system and essential for its function.
11. Cholesterol serves as a precursor for the formation of bile acids.

Sources of fat : Ghee, butter, cheese, hydrogenated oils (vanaspathi), groundnut oil, gingelly oil, coconut oil, milk, curd, egg, meat and fish.

Deficiency diseases : Deficiency of fat results in flaky skin, development of itchy sores on the scalp and phrynoderma or toad skin.

2.3. Vitamins

Vitamins may be defined as organic compounds occurring in small quantities in different natural foods and necessary for the growth and maintenance of good health in human beings.

Vitamins are classified into two groups based on their solubility as water soluble and fat soluble. Water soluble vitamins, if excess are excreted in urine, while fat soluble vitamins are stored in the liver along with fat.

Vitamins

Fat soluble vitamins	Water soluble vitamins
A,D,E,K	**B_1, B_2, B_6, B_{12}, C.**

Vitamins	Chemical names
A	Retinol
B_1	Thiamine
B_2	Riboflavin
B_3	Niacin
B_6	Pyridoxine
B_{12}	Cyanocobalamin
C	Ascorbic Acid
D	Cholecalciferol
E	Tocopherol

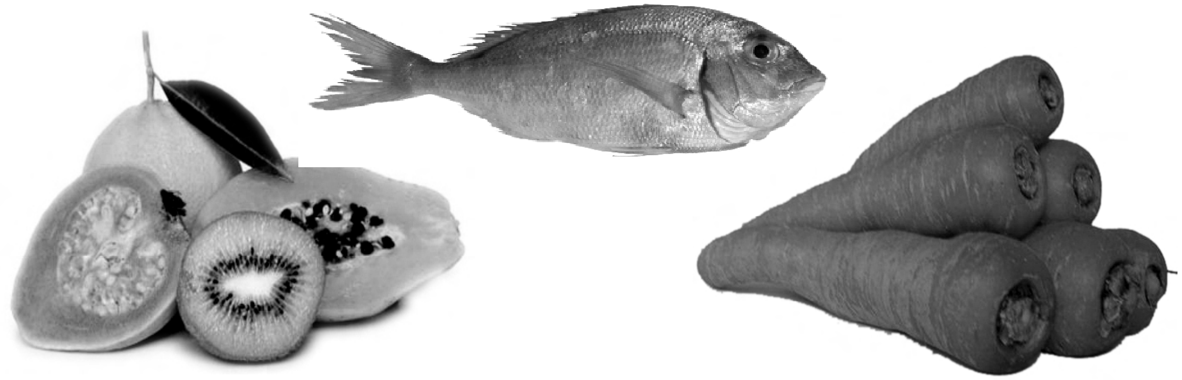
2.3. (a) Fat soluble vitamins

Vitamin A

Functions:

1. Vitamin A plays an important role in vision in dim light.
2. It is essential for the integrity of the mucous secreting cells of epithelial tissues.
3. It is essential for normal bone formation.
4. Vitamin A deficiency causes degeneration of the myelin sheath of nervous tissue.
5. Vitamin A is essential for the synthesis of mucoproteins and glycoproteins.
6. It is essential for normal reproduction.

Sources



Vitamin A is present only in foods of animal origin such as liver, fish liver oil, eggs, milk, fatty fish, ghee and butter. Plant foods contain only β-carotenes which are converted to vitamin A in the body. Yellow and orange coloured fruits and vegetables such as papaya, mango, tomato, yellow pumpkin, carrot, green leafy vegetables are good sources of β-carotene.

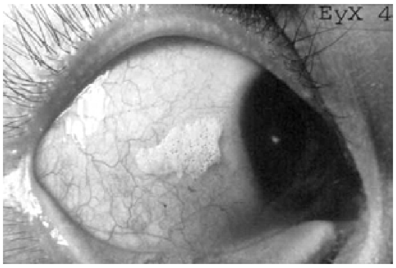
Vitamin A deficiency diseases

a) Night blindness : In the early stages of vitamin A deficiency the individual cannot see properly in dim light.

b) Bitot's spots : Foamy white patches are found on the conjunctiva of the eye.

c) Xerosis conjunctiva : The conjunctiva becomes dry and thickened.

d) Xerosis cornea : The cornea becomes dry and lack lustre.



Bitot's spots

e) Keratomalacia : When xerosis of the conjunctiva and cornea are not treated properly it may develop into a condition known as Keratomalacia or total blindness.

Vitamin D

Functions

1. Vitamin D promotes the absorption of calcium and phosphorus from small intestine.
2. It also acts on the bones directly promoting calcification
3. It regulates the concentration of calcium in blood plasma

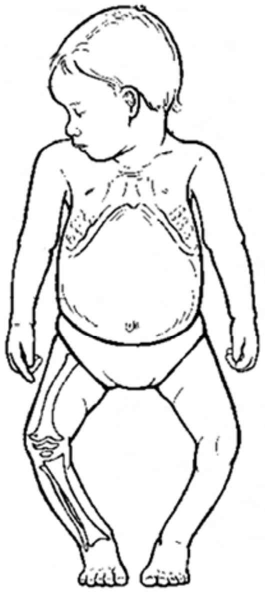
Sources

Good sources of vitamin D include sunlight, liver, fish liver oils, fish, butter and cheese.

Vitamin D Deficiency Diseases

It results due to inadequate absorption of calcium and phosphorus from the intestinal tract. It leads to rickets in children, osteomalacia and tetany in adults. Rickets is characterized by delayed closure of skull bones, box like head, knock knees, bow legs, pigeon chest, narrowing of pelvis, spinal curvature, wrist enlargement and pot belly.

Osteomalacia will include symptoms like softening of bones, easy fractures, bending of spinal cord and pain in legs and back bones. Tetany is caused due to low serum calcium and leads to muscle cramps and convulsions.



Rickets

Vitamin E

Functions

1. It is essential for normal reproduction in man
2. It is required for the normal functioning of the immune system
3. It is an antioxidant, which reduces the incidence of heart diseases and cancer.

Sources

Vegetable oils and fats, nuts and oil seeds and whole grams are the richest natural sources of vitamin E.

Vitamin E Deficiency Diseases

Vitamin E deficiency causes reproductive failure and liver necrosis.

Vitamin K

Functions

1. Vitamin K is essential for blood coagulation.
2. It is required for the synthesis of various chemical substances needed for blood clotting.

Sources

The rich source of vitamin K is dark green leafy vegetables. It is also present in the liver, pulses, cereals and green tea leaves.

Vitamin K Deficiency Diseases

It leads to hemorrhagic conditions or delay in blood clotting, when there is a wound.

2.3. (b) Water Soluble Vitamins

B Complex vitamins

1. Thiamin or Vitamin B_1

Functions

1. It is essential for growth
2. It is essential for maintaining the nerves in a normal condition.
3. It plays an important role in carbohydrate metabolism.

Sources

Whole wheat, millets, raw hand pounded rice or parboiled rice, whole grams, yeast, organ meats or liver, eggs.

Deficiency Diseases

1. Dry Beri Beri
2. Wet Beri Beri

The symptoms are loss of appetite, tingling and numbness of the legs and hands, wasting of muscle and difficulty in walking, oedema in the legs, enlargement of the heart, palpitation and breathlessness.

Riboflavin or Vitamin B_2

Functions

1. Plays a role in the regulatory functions of some hormones involved in carbohydrate metabolism.
2. Free riboflavin is present in the retina which is converted by light to a compound involved in the stimulation of the optic nerve.
3. Plays an important role in many enzyme systems involved in the metabolism of carbohydrate, fat and proteins.
4. Involved in the formation of red blood cells in the bone marrow.

Sources

Rich sources of riboflavin include milk and milk products, eggs, liver and dried yeast. Good sources are green leafy vegetables, whole cereals, millets, meat and fish.

Deficiency Diseases

a. Angular stomatitis (lesions at the angles/corners of the mouth)

b. Glossitis (tongue in general is acutely inflamed and reddish in colour).

c. Cheilosis (dry and chopped appearance of the lips).

Angular stomatitis

3. Niacin or Nicotinic Acid or Vitamin B_3

Functions

1. Essential for the normal functioning of the skin, intestinal tract and nervous system.
2. Nicotinic acid is a component of two coenzymes NAD and NADP which take part in several enzymatic reactions.

Sources

Groundnuts, dried yeast and liver are the rich sources of vitamin B_3 and the fair sources include millets, cereals, maize and eggs.

Deficiency Diseases

Niacin deficiency causes pellagra. It is also called as a Disease of 3D's. The disease has the symptoms of diarrhoea, dermatitis and dementia. Glossitis, diarrhoea

and vomiting are seen in most cases. Dermal lesions and mental disturbances like irritability, depression, inability to concentrate and poor memory are common in niacin deficiency.

4. Pyridoxine or Vitamin B_6

Functions

1. Pyridoxine functions as a co-enzyme for many reactions.
2. It is essential for growth of infants
3. It helps in the prevention of macrocytic anaemia

Sources

Meat, pulses, wheat and dried yeast are good sources while green leafy vegetables and other cereals are fair sources of this vitamin.

Deficiency Diseases

a. Hypochromic microcytic anaemia
b. Sleep disturbances, irritability and depression
c. Angular stomatitis, glossitis and cheilosis

5. Cyanogobalamin or Vitamin B_{12}

Functions

1. It is essential for the maturation of red blood cells in bone marrow
2. It is involved in protein metabolism and synthesis of nucleic acids and nucleoproteins
3. It is essential for the formation of myelin in nerve fibre
4. It enhances patient's health and appetite
5. It helps in proper functioning of nervous system
6. It is necessary for the synthesis of amino acids like choline and methionine

Sources

It is found mainly in animal foods such as meat, oyster, seafood, egg and milk.

Deficiency Diseases

Deficiency of this vitamin results in pernicious anaemia (macrocytic anaemia). The nervous system is affected and this may lead to degeneration of the nerve fibres.

6. Folic acid

Functions

1. It is necessary for the maturation of red blood cells.
2. It is required for the normal growth and development of all the cells.
3. It plays a role in the metabolism of some amino acids
4. It prevents megaloblastic anaemia

Sources

Fresh green leafy vegetables, yeast, liver and eggs, sprouted grams are rich sources. Cereals, pulses, nuts, oil seeds and other vegetables (ladies finger and cluster beans) are fair sources of this vitamin.

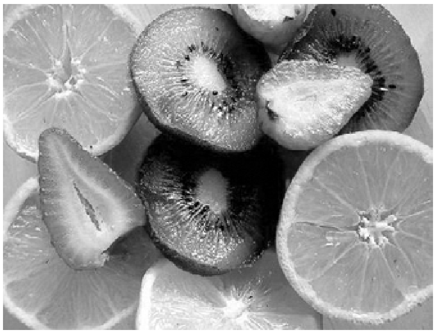
Deficiency Disease

Deficiency of folic acid results in macrocytic, megaloblastic anaemia.

7. Ascorbic acid or Vitamin C

Functions

1. Vitamin C is essential for the formation of collagen and intercellular cementing substances
2. It helps in the absorption of iron and incorporation of plasma iron into ferritin
3. It helps in the formation of bone
4. It is essential for the functioning of adrenal cortex
5. Vitamin C helps in the synthesis of neurotransmitters
6. It facilitates calcium absorption from the intestine
7. Vitamin C is needed for the detoxification of drugs
8. It is essential for the activation of hormones



Sources

The rich sources of vitamin C include amla, guava and citrus fruits like lime, oranges and sprouted pulses. Good sources include green leafy vegetables and fruits like papaya and tomato.

Deficiency Diseases

Severe deficiency of vitamin C results in the development of the disease scurvy. The disease is characterized by

a. General weakness followed by shortness of breath, pain in bones, joints and muscles of the extremities.
b. Swollen and tender joints, hemorrhages in various tissues.
c. Bleeding gums and loose teeth.

2.4. Minerals

Mineral elements are an important group of nutrients necessary for the growth and development of the body. Minerals do not act singly in their regulation of body processes but work with the help of other minerals and organic compounds.

1. Calcium :

Calcium makes up 1.5 to 2 per cent of body weight. Almost 99 per cent of calcium is found in the hard tissues of the body namely the bones and teeth. The remaining one percent is found in the blood.

Functions:

1. It is essential for the formation of bones and teeth
2. It is essential for clotting of blood
3. It regulates the permeability of capillary walls.

4. It is essential for the contraction and relaxation of heart and muscle.
5. It regulates the excitability of nerve fibres and nerve centres.
6. It acts as an activator for the enzymes present in the gastric juice.

Sources: Milk, milk powder, cheese, sesame seeds, ragi, green leafy vegetables(eg: drumstick leaves, palak), custard apple, dry fish.

Deficiency Diseases: Among children, a decreased rate of growth is found. Among adults negative calcium balance, osteoporosis, hyperplasia (a diffuse overgrowth of parathyroid gland), hyper irritability and tetany leading to death are found. Osteomalacia occurs in women after repeated pregnancies.

2. Iron

Most of the iron in the body is found in the blood, but some amount is present in every cell bound to iron containing enzymes.

Functions

1. It is required for the transport and storage of oxygen in cells and tissues.
2. It acts as co-factors for enzymes and other proteins.
3. It is required for the formation of red blood cells.

Sources

Seasame seeds, jaggery, green leafy vegetables (eg: palak, agathi, mint) dates, dry grapes, meat, egg, soyabean, liver.

Deficiency Diseases

Anaemia - pale and smooth tongue, pale lips, eyes and skin, brittle spoon shaped nails (Koilonychia), exhaustion, fatigue, head ache, giddiness and other symptoms like dimness of vision, sleeplessness, parasthesia, (tingling sensation in arms and legs), chest pain.

Koilonychia

3. Iodine

Functions

1. Iodine is a constituent of thyroxin, the active hormone of thyroid gland.
2. It plays an important role in energy metabolism and in the growth of the body.

Sources

Iodine is present only in small amounts in common foods. The quantity of iodine present depends on the iodine content of the soil. Iodised salt and sea fish are good sources of iodine.

Deficiency Diseases

If sufficient iodine is not taken in the diet it results in goiter (enlargement of thyroid gland). In children severe deficiency of iodine results in serious retardation of growth called cretinism. Iodine deficiency can be treated with administration of iodised salt in the diet.

Goiter

Table 2.3 presents the classification of nutrients, sources and deficiency diseases.

Table 2.3: Nutrients, their Sources and Deficiency Diseases

S. No.	Nutrients	Sources	Deficiency diseases and clinical signs
1.	Carbohydrate	Cereals (Rice, ragi, wheat, maize, bajra) Jaggery, cane sugar, Roots and Tubers (Potato, tapioca, sweet potato, yam), dried fruits, jack fruit, banana.	Underweight, weight loss, reduced energy to do work
2.	Protein	Meat, eggs, fish, poultry and oil seed meals, legumes and pulses like peas, soya bean, green gram, gingelly seeds, milk and milk products	Protein Energy Malnutrition (PEM), Kwashiorkor, marasmus, loss of appetite, vomiting and diarrhoea, severe muscle wasting, skin and hair changes, edema, swelling of leg, feet and belly
3.	Fat	Butter, ghee, milk, curd, cheese, chicken, pork, mutton, fish, egg, nuts and oil seeds, hydrogenated fat (vanaspathy), groundnut oil, gingelly oil, coconut oil	Flaky skin, phrynoderma or toad skin
4.	**Vitamins- Fat soluble** Vitamin - A (Retinol)	Liver, fish liver oil, egg, milk, fatty fish, ghee, butter, papaya, mango, tomato, carrot, yellow pumpkin, green leafy vegetables	Inability to see in dim light, night blindness. Bitot's spots, xerosis of the conjunctiva and cornea, softening of the cornea leading to blindness (keratomalacia)

S. No.	Nutrients	Sources	Deficiency diseases and clinical signs
5.	Vitamin - D, (Cholecalciferol)	Sun light, liver, fish, liver oil, milk, cheese and butter.	Muscular tetany, rickets in children and osteomalacia in adults
6.	Vitamin - E (Tocopherol)	Vegetable oils, nuts and legumes, bran and germs of cereals, egg yolk, dark green leafy vegetables	Reproductive failure, liver necrosis.
7.	Vitamin - K (Quinone)	Dark green leafy vegetables, cereals, pulses and liver, dried green tea leaves	Hemorrhagic conditions, delay in blood clotting
8.	**Water soluble vitamins** Vitamin - B_1 (Thiamin)	Wheat germ, dried yeast, rice polishing, whole cereals, hand pounded rice, parboiled rice, whole grams, oilseeds, liver, egg, dried yeast	Beriberi-dry beriberi, wet beriberi, fatigue, loss of appetite, tingling and numbness of legs and hands, oedema in legs, enlargement of heart, palpitation and breathlessness.
9.	Vitamin - B 2 (Riboflavin)	Liver, dried yeast, egg, fish, milk and milk products, whole cereals, legumes, oilseeds and nuts, green leafy vegetables.	Angular stomatitis (ie) cracks at the corners of the mouth, cheilosis (Raw red cracked lips) glossitis (Glossy tongue) ulcers in the oral cavity, burning, itching
10.	Vitamin - B3 (Niacin)	Liver, dried yeast, rice polishing, peanut, whole cereal, legumes, meat, fish	Pellagra or Disease of 3D's. Diarrhoea, Dermatitis, Dementia, sour mouth
11.	Vitamin B6 (Pyridoxin)	Meat, pulses, wheat, dried yeast, green leafy vegetables.	Hypochromic microcytic anaemia, sleep disturbances, irritability and depression, convulsion
12.	Vitamin B12 (Cyanogobalamin)	Liver, milk, egg, meat, poultry, fish	Pernicious anaemia, numbness and tingling in fingers and toes
13.	Folic acid	Green leafy vegetables, yeast, liver, egg, cereals, pulses, nuts, oil seeds, ladies finger, cluster beans, sprouted grams	Macrocytic, megaloblastic anaemia

S. No.	Nutrients	Sources	Deficiency diseases and clinical signs
14.	Vitamin C (Ascorbic acid)	Amla, guava, lime and other citrus fruits, green leafy vegetables	Scurvy - bleeding gums, loose teeth, delayed wound healing, joint pain, hemorrhages in various tissues
15.	**Minerals -** Calcium	Milk, milk powder, seasame seeds, dry fish, ragi, green leafy vegetables (drumstick leaves, palak, coriander leaves) custard apple.	Decreased rate of growth, Negative calcium balance, Osteoporosis, Hyperplasia (a diffuse over growth of parathyroid glands), joint pain, brittle bones
16.	Iron	Agathi, amaranth, mint, coriander leaves, drumstick leaves, spinach, sesame seeds, jaggery, dates, dry grapes, meat, egg, soya bean, liver.	Anaemia - pale smooth tongue, pale lips, eye and skin, spoon shaped nails (Koilonychia) exhaustion, fatigue, head ache, dimness of vision, sleeplessness, paraesthesia in leg and hands, chest pain
17.	Iodine	Iodised salt, seafish.	Enlargement of thyroid gland-goiter, retardation of growth in children - cretinism.

2.5. Water

Human body contains about 65 per cent water. Water is next only to oxygen in its vital importance to the body. One can live without food for a longer time than one does without water. As a ready reckoner, a person's requirement of water is equal to his calorie requirements. Water is obtained from the fluids people drink, solids they eat and from oxidation of energy yielding foods. Water is absolutely necessary for digestion, absorption, regulating body temperature, for removing waste water, for transporting nutrients and substances and for lubricating the joints.

Functions : The body water is of utmost important and has specific functions to perform.

1. It acts as a solvent for the secretary and excretory products.
2. It acts as a carrier of nutritive elements of tissues and removes waste materials from tissues.
3. It is a regulator of body temperature
4. Water is a solvent for electrolytes. It helps to regulate the electrolyte balance of the body and maintain a healthy equillibrium of osmotic pressure exerted by the solutes dissolved in water.
5. It acts as a lubricant for the joints

Requirement:

Requirement of water varies with climate, dietary constituents, activities and surface of the body. As a rule a person should take enough water to excrete about 1200-1500 ml of urine per day. In tropics, because of greater water loss through perspiration, increased water intake is required to maintain urine volume. Normal water intake ranges between 8-10 glasses per day.

Daily Intake of Water

1. As fluid drinks - water, tea, coffee, milk, soup	:	1500 - 1750ml
2. Water intake through solid foods	:	600 - 900ml
3. Oxidation of carbohydrate, fat, protein	:	300 - 350ml
		2400 - 3000ml

Daily Output of Water

Urine (Kidney)	-	1200 - 1500 ml
Perspiration (Skin)	-	700 - 900 ml
Respiration (Lungs)	-	400 ml
Faeces (Intestine)	-	100 - 200 ml
		2400 - 3000 ml

Water intake and output should be fairly constant. This is called water balance. Inadequate water intake disturbs water equillibrium resulting in decreased urinary output. The water equilibrium is maintained by kidney, lungs, intestine and pituitary gland. The water balance coordinates with both electrolyte and acid base balance.

Water Balance : A healthy body maintain water imbalance even on variable intake or output of fluids. The regulation is done by the antidiuretic hormone (ADH) and vasopressin.

A body is said to maintain water balance when the amount of water gained by the body is equal to the amount of water excreted or lost from the body.

Water content in foods : In leafy greens there is 90 percent or more moisture. Fruits and vegetables contain plenty of moisture to the extent of 70-80%. Cereals and pulses contain only about 10-12%, while nuts and oilseeds contain only 4-5%. Fluids like milk contain about 80-90% water. Fats and oils except butter and margarine contain no moisture. Butter contains about 19% moisture.

Role of water in food preparation

1. As a cooking medium : Its free availability, its nature and its low cost of supply are some of the factors which influence the use of water as a cooking medium, the neutral pH

of water is very useful in that it does not react with the food constituents, thus preventing any adverse changes in the cooked food.

2. As a solvent : Water is a universal solvent for many food substances. The characteristic flavours of soups, dhals, tea, coffee depend upon the ability of water to dissolve or extract the flavouring agents present in the foods. Water also dissolves colour pigment.

3. Water as a leavening agent : Water acts as a leavening (puffing) agent. When batters and doughs are exposed to heat, the water present is converted in to steam. The steam expands and is responsible for the leavening effect. Eg. Rising of cakes, puffing of chappathies and poories.

4. Water affects the keeping quality of foods : Perishable foods which have a high moisture content can be kept only for a short period. (eg) Milk, paneer, meat, fish, fruits and vegetables. Cereals, dhals and legumes with a moisture content below 13% are non-perishables if stored in a cool, dry place. Semi perishables can be stored for a week or a month at room temperature without any undesirable changes. (eg). Biscuits, roasted channa dhal etc.,

5. Water affects the texture and consistency : The amount of moisture present in a food affects its texture, consistency and feel in the mouth. Soft foods and liquid foods are swallowed easily, while crisper foods are difficult to swallow. For this reason, dry foods like toast is normally buttered and other foods served with tea. Thus water is an important nutrient in the daily diet of humans.

Causes and Effects of Dehydration

Causes

When water is constantly lost from the body as in severe vomitting, diarrhoea, excessive sweating or excessive urine formation due to treatment with diurectics the total water content of the body is reduced. Reduction of extra cellular and intra cellular fluid leads to dehydration.

Effects of dehydration

1. Tongue becomes dry.
2. Pinch test is done by raising and releasing the skin. Slow return of skin to original position indicates decreased extra cellular fluid.
3. Decrease in plasma volume reduces cardiac output and may lead to cardiac failure.

Preventation of dehydration

Dehydration can be prevented by taking sufficient amounts of water as fluids. The correction of dehydration is called rehydration.

Oral Rehydration therapy

It is the adminstration of fluid to prevent or correct dehydration.

Oral Rehydration Solution (ORS): WHO, UNICEF formula consists of NaCl 3.5 g,(Sodium chloride), $NaHCo_3$ - 5g. (Sodium Bicarbonate) KCl - 1.5g (Potassium chloride)

and glucose 20g to be dissolved in one litre of potable drinking water.

The glucose present aids in the absorption of sodium chloride and potassium chloride apart from giving energy. This mixture is administered through the oral route at frequent intervals until the normal state is attained.

Potable water is the water which is safe and wholesome. It should be

a) free from pathogenic agents

b) free from harmful chemical substances.

c) Pleasant to taste; free from colour and odour

d) Usable for domestic purpose.

Questions

SECTION - A

I. A. Choose the correct answer

1. An important source of energy in the diet is

   a) Carbohydrates b) Proteins c) Vitamins

2. The calorific value of foods is expressed using

   a) Kilocalorie b) Kilovolts c) Kilogram

3. Kwashiorkar. is due to the deficiency of

   a) Carbohydrate b) Calcium c) Protein

4. .... serves as a precursor for the formation of bile acids.

   a) Phospholipids b) Cholesterol c) Proteins

5. Vitamin A deficiency leads to

   a) Night blindness b) Osteomalacia c) Beri Beri

6. Pellagra is the disease caused by the deficiency of

   a) Riboflavin b) Vitamin D c) Niacin

7. Citrus frutis are rich source of

   a) Vitamin C b) Vitamin D c) Vitamin A

8. Iron deficiency leads to

   a) Anaemia b) Rickets c) Beri Beri

9. Iodine deficiency leads to

   a) Night blindness b) Anaemia c) Goiter

10. Daily intake of water should be

   a) 3000 ml b) 1500 ml c) 2000 ml

B. Answer in one or two sentences

1. Expand BMR.
2. Write the three types of carbohydrates.
3. Write any 2 sources of protein.
4. Define vitamins.
5. Name the disease which affect children due to the deficiency of Vitamin D.
6. Write the deficiency diseases of riboflavin.
7. Write the sources of folic acid.
8. Name the harmone involved in body water balance.
9. Write the chemical name of B_{12}.
10. Name the vitamin which is essential for blood clotting.

SECTION - B

II. Write in five lines

1. Define kilocalorie
2. Write a short note on dietary fibre.
3. List the symptoms of Kwashiorkar.
4. What are the deficiency diseases of Vitamin A.?
5. What are the functions of riboflavin?
6. Write the functions of folic acid.
7. Write the sources of iron.
8. Write the functions of water.
9. Write the types of vitamins.
10. Write the symptoms of fat deficiency.

SECTION - C

III. Write in one page

1. Write the functions and sources of protein.
2. Write in detail about any four factors which affects energy requirement.
3. List the functions of fats.
4. What are the functions of vitamin C and discuss on the deficiency diseases?
5. Write on the daily intake and output of water.
6. What are the causes and effects of dehydration.
7. Bring out the uses of fibre.
8. What are the rich sources, deficiency diseases and signs of thiamine and riboflavin.
9. Discuss the sources, deficiency diseases and signs of calcium, iron and iodine.
10. Write the functions of pyridoxin and cyanogobalamin.

SECTION - D

IV. Write in detail

1. Discuss carbohydrates - under the following headings:
   a) Classification b) Functions c) Sources d) Deficiency
2. Explain in detail about fat soluble vitamins.
3. Enumerate the factors affecting BMR.
4. Write the role of water in food preparations.
5. Explain the functions of dietary fibre.

3. NUTRITIONAL STATUS AND THERAPEUTIC DIETS

Assessment of nutritional status of the community is one of the first steps in formulating programmes to overcome malnutrition. Diets are modified to suit the diseased condition and referred as therapeutic diets. These include routine hospital diets, special diets and feeding methods.

3.1. Nutritional Status

Nutritional status is the condition of health of the individual as influenced by the utlilization of the nutrient. It can be determined by correlation of information obtained through medical and dietary history, thorough physical examination and laboratory investigation.

Nutritional assessment aids in identifying under nutrition, over nutrition, nutritional deficiencies, individuals at the risk of developing malnutrition or nutritional related diseases and the resources available to assist them to overcome nutritional problems. The nutritional status can be assessed by the following methods.

I. Direct Methods

a) Nutritional Anthropometry
b) Clinical Examination
c) Biochemical tests and
d) Biophysical methods

II. Indirect Methods

a) Vital statistics of the community
b) Assessment of socio-economic status and
c) Diet surveys

I. Direct Methods

a) Anthropometric Measurements and Indices

Nutritional anthropometry is concerned with the measurements of the variations of physical dimensions and body composition at various stages of life cycle. It is a field-oriented method, which can be easily adopted and interpreted.

The basic measurements which should be made on all age groups are weight in kg, length / height in cm and arm circumference in cm.

1. Weight :

Weight gain is an indicator of growth in children. It is measured with the help of the weighing scale. Body weight should be determined after the first void and before ingestion of food.

The weight for age can be compared with the standards of ICMR and the nutritional status can be interpreted. The standard reference body weight (kg) of Indians of different age groups is given in the table 3.1.

Table 3.1 : Reference Body Weight (kg) of Indian of Different Age Groups

	Age (in years)	Male	Female
Infant children	0 - ½	5.4	5.4
	½ - 1	8.6	8.6
	1 - 3	12.61	11.81
	4 - 6	19.20	18.69
	7 - 9	27.0	26.75
	10 -12	35.54	37.91
Adolescents	13 - 15	47.88	46.66
	16 - 18	57.28	49.92
Adults	20 - 50	60	50

Source: ICMR (2002) Nutrient Requirements and recommended dietary allowances for Indians NIN.

Anthropometric Indices : Weight for Age : The nutritional status can be interpreted using Gomez classification as follows:

Weight $\geq$ 90% weight for age	- Normal
76 - 90% weight for age	- Grade I malnutrition
61 - 75% weight for age	- Grade II malnutrition
$\leq$ 60% weight for age	- Grade III malnutriton

Linear Measurements : Two types of linear measurements are commonly used. These are height or length of the body and circumference of the head and the chest.

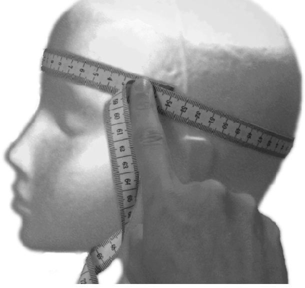
2) Height : The height of the individual is the sum of four components: leg, pelvis, spine and skull.

The height of an individual is measured using a stadiometer. For infants and children recumbent length (Crown-heel length) is measured. The measurement is compared with the standards of the ICMR as given in table 3.2 to assess nutritional status. The desirable birth weight and length of an infant is 3 kg and 50 cm respectively. But the time the baby turns the first birth day the birth weight is trebled and an increment of 25 cm in length is reached.

Table : 3.2. The Standard Reference Height for Indians of Different Age Groups

Age (years)	Height in cm	
	Boys	Girls
1+	80.07	78.09
2+	90.01	87.93
3+	98.36	96.21
4+	104.70	104.19
5+	113.51	112.24
6+	118.90	117.73
7+	123.32	122.65
8+	127.86	127.22
9+	133.63	133.08
10+	138.45	138.90
11+	143.35	145.00
12+	148.91	100.98
13+	154.94	153.44
14+	161.70	155.04
15+	163.33	155.98
16+	168.40	156.00

Source: ICMR (2002) Nutrient Requirements and Recommended Dietar Allowances for Indian NIN.



3) Head circumference : The measurement of head circumference is a standard procedure to detect pathological condition in children. Head circumference is related to brain size. At birth the circumference of head is greater than that of the chest.

4) Chest circumference : The circumference of the head and the chest are about the same at six months of age. After this the skull grows slowly and the chest more rapidly. Therefore, between the ages of six months and five years the chest / head circumference ratio is less than one may be due to failure to develop or due to wasting of muscle and fat of chest. In nutritional anthropometry the chest / head circumference ratio is of value in detecting under nutrition in early childhood.

5) Mid Upper Arm Circumference (MUAC) : Mid upper arm circumference at birth in a healthy child is between 10 - 11 cm. Over the first year the increment in MUAC is 3 to 4 cm as the muscles of the arms start to develop. Hence MUAC is an age independent index. The nutrition scientitists in our country have fixed the desirable value for MUAC as 12 cm for Indian preschool children. In the field condition a bangle with a diameter of 4 cm can be used as a tool to detect malnutrition. When the bangle moves smoothly over the mid-upper arm of the child, it indicates malnutrition. The bangle test can be conducted with ease in field condition to screen malnourished.

b) Clinical signs of nutritional deficient disorders

Clinical examination is an important practical method for assessing the nutritional status of a community. Essentially, the method is based on examination for changes, believed to be related to inadequate nutrition that can be seen or felt in the superficial epithelial tissues especially the skin, eyes, hair or in organs near the surface of the body such as the parotid and thyroid glands. Clinical assessment must always be carried out by individuals with adequate training. The following simple guide is employed to interpret the following deficiencies.

Guide for the interpretation of deficiencies and identifying the clinical signs.

Conditions	Clinical signs
i) Protein Energy Malnutrition	Oedema, depigmentation, sparseness and easy pluckability of hair, moon face, enlarged liver, muscle wasting
ii) Vitamin A deficiency	Night blindness, bitot's spots in the eye, xerosis of skin.
iii) Riboflavin deficiency	Angular stomatitis, cheilosis
iv) Thiamine deficiency	Oedema, sensory loss, calf muscle tenderness
v) Niacin deficiency	Raw tongue, pigmentation of the skin
vi) Vitamin C deficiency	Spongy and bleeding gums
vii) Vitamin D deficiency	Rickets, beading of ribs, knock knees, bowed legs
viii) Iron deficiency	Pale conjuctiva, spoon shaped nails
ix) Iodine deficiency	Enlargement of thyroid gland

c) Biophysical methods : The biophysical methods are used to assess the alterations in functions associated with inadequate nutrition (eg) Dark adaptation test is used to evaluate the ability to see in the dim light.

d) Biochemical test : Biochemical tests can be used to detect the deficiencies by analysing blood, urine, stools and phlem for (eg) Estimation of haemoglobin in blood to detect iron deficiency.

II. Indirect Methods

a) Vital statistics : Malnutrition influences morbidity, mortality, life expectancy and other health statistics may therefore be considered as indirect indicators of nutritional status of the community. Infant mortality rate, maternal mortality rate and morbidity rate are the vital statistics that can be used to assess the nutritional status of the community.

b) Assessment of socio-economic status : Low food availability, increased family size, unsanitary living conditions, inadequate knowledge of nutritional needs, inappropriate weaning practices are powerful social, cultural and economic factors which influence nutritional status.

c) Diet surveys : Diet surveys are helpful in studying the quality and quantity of food consumed by the family and the community. The techniques of collecting information on food consumption include.

1) Food Inventory Method : This method is usually employed in institutions where homogenous group of people take their meals in a common kitchen eg. Hostels, orphanages.

2) Food expenditure pattern method : In this method information on the amount spent on food and non-food items during the previous month or week is collected using a questionnaire.

3) 24 hour recall : In this method a set of standardized cups suited to local conditions are used. The standard cups help the respondent to recall the quantities of food prepared and fed to individual members on the previous day. This is usually done for three consecutive days.

4) Diet history : This method is useful for obtaining qualitative details of diet and studying patterns of food consumption at household and industrial level. This method is used to study meal pattern, dietary habits, food preferences and avoidances during sickness.

5) Weighment method : In this method, the food either raw or cooked is actually weighed using an accurate balance. It requires extreme co-operation of the housewives.

3.2. Routine Hospital Diets

They are the most frequently used diets in all the hospitals. They are used for patients whose condition does not necessitate a special diet. The regular hospital diets are simple in nature and preparation, easy for digestion and planned to provide maximum nourishment. The diets are well balanced, adequate in nutritional value and attractively served to stimulate poor appetite.

The objectives of the diet therapy are as follows:

a. To correct the existing dietary deficiencies and to maintain the patient in good nutritional status

b. To meet the nutritional needs of the patient, taking into consideration of his food habits

c. To educate the patient regarding the need for adherence to the prescribed diet.

Diet therapy, in most instances is not a remedy in itself but is a measure which supplements or makes the medical or surgical treatment more effective. Therapeutic diets are concerned with the modification of the normal diet to suit the requirements of the various diseases.

Factors to be considered in planning Therapeutic diets

a. The underlying disease conditions which require a change in the diet

b. The possible duration of the disease

c. The type of modification in the diet to overcome these conditions

d. The patient's tolerance for food by mouth.

The normal diet may be modified to

a. Provide change in consistency as in fluid and soft diets

b. Increase or decrease the energy value

c. Include greater or lesser amounts of one or more nutrients for example high protein, low sodium etc.

d. Include foods bland in flavor.

The different types of routine hospital diets are light diet, fluid diet and soft diet.

Light diet : This is considered as a transitional diet and is used for a limited period or until the patient is ready to accept a general diet. The chief difference between light and general diet is that very simple preparation of the food is allowed. Fried foods, highly seasoned foods, rich pastries, coarse foods and fatty foods are omitted.

Fluid diet : Fluid diets are used in febrile conditions post operatively or whenever the patient is unable to tolerate solid foods. The degree to which these diets are adequate will depend upon the type of liquids permitted.

a. Clear fluid diet: Whenever an acute illness or surgery produces a marked intolerance for solid food as may be evident by nausea, vomiting, anorexia, distention and diarrhoea, it is advisable to restrict the intake of nutrients. A clear fluid diet is used for 1 to 2 days at the end of which the patient is usually able to tolerate and utilize a more liberal liquid diet.

Tea with lemon and sugar, coffee, fat free broth, carbonated beverages and strained barley water are usually given. A more liberal clear fluid diet permits use of egg white and gelatin with strained fruit juices. Clear fluid diet is usually restricted to 30 to 60 ml per hour and later increased. Clear fluid diet provides 400-500 kcals, 5g proteins, negligible fat and 100-120g of carbohydrates.

Menu Plan for Clear Fluid Diet

6.30 AM	Early morning	Tea without milk or lime tea and sugar 1 cup
8.00 AM	Breakfast	Coffee without milk (Black coffee) 1 cup
10.00 AM	Mid morning	Aerated beverage, Tender coconut water or fruit juice 250 ml
12.00 Noon	Lunch	Clear vegetable soup 200 ml or dhal water 150 ml
2.00 PM	Mid afternoon	Orange juice 200 ml with glucose
4.00 PM	Tea time	Barley water 200ml
6.00 PM	Evening	Coffee or tea without milk 1 cup
8.00 PM	Dinner	Clear vegetable soup 200ml
9.00 PM	Bed time	Ginger ale 200ml

b. Full fluid diet : This diet is usually prescribed after surgery, in acute infections, difficulty in swallowing and acute inflammatory conditions of the gastrointestinal tract. With subsequent recovery, the liquid diet is modified to a soft diet which in turn gives way to full, general diet. As the name implies the liquid diet consists primarily of liquid or strained semi-liquid foods. Its purpose is to satisfy the normal requirements for the nutrient in a form which requires minimum physiological efforts for digestion and absorption. The full liquid diet consists of milk, milk drinks, carbonated beverages, coffee, tea, fruit juices, tomato juice, broth, raw eggs, cream, melted butter, strained vegetables (in soups), honey, syrups, sugar and dry skim milk dissolved in liquids. Fortified egg nogs and milk shakes are important nutritional mainstays of the liquid diet.

Full fluid diet

Menu Plan for Liquid Diet (Full Fluid Diet)

6.00 AM	Early morning	Tea or coffee1 cup
8.00 AM	Breakfast	Egg-nog 1 glass
10.00 AM	Mid morning	Fruit juice 1 glass
12.00 Noon	Lunch	Strained vegetable soup with butter 1 cup
2.00 PM	Mid afternoon	Ice cream 1 cup
4.00 PM	Evening	Tea 1 cup
7.00 PM	Dinner	Rice porridge 1 cup
9.00 PM	Bed time	Milk or apple milk shake 1 glass

c. Soft Diet : Many patients are placed on a soft diet till the disease is diagnosed. This diet is soft in texture and bland in flavor. The soft diet is used as a transition diet, it represents the usual dietary step between the full fluid and normal diet.

Mild flavoured low fibre vegetables, cooked fruits without seeds or skin, ripe banana, refined cereals, milk and milk products can be used.

Strongly flavoured and high fibre vegetables, raw fruits, coarse cereals, tough meats, fried foods, highly seasoned foods are to be avoided.

Many persons require a soft diet simply because they have no teeth. The objective of diet planning for such individuals is to modify the normal diet so that foods require little chewing. The terms 'mechanical soft' and 'dental soft' are used in some diet manuals to describe such a dietary modification. Patients who have undergone head or neck surgery are also given soft diet.

Soft Diet

Menu Plan for a Soft Diet

6.00 AM	Early morning	Tea or coffee 1 cup
8.00 AM	Breakfast	Bread with butter - 2 slices or idli - 2 Soft cooked egg - 1
10.00 AM	Mid morning	Banana milk shake - 1 glass
12.00 Noon	Lunch	Rice-1 cup, potato and palak curry - ½ cup Moong dhal 1 cup; Curd 1 cup and fruit - 1
2.00 PM	Mid afternoon	Fruit juice (Orange or lime) - 1 cup
4.00 PM	Evening	Tea 1 cup, bread with butter, jam-2 slices or sundal - ½ cup
7.00 PM	Dinner	Noodle with well cooked vegetables or rice kicheri - 1 cup Curd ½ cup; stewed apple or custard - ½ cup

3.3. Special Feeding Methods

The special feeding methods depend on the type of disease, the patients' conditions and his tolerance to food. The different modes of feeding patients are

1. Enteral 2. Parenteral

Enteral : By definition, enteral means within or by the way of the gastrointestinal tract. As far as possible the patient should be encouraged to ingest food through the oral route. supplements may be added whenever necessary. The foods are administered via a tube and hence enteral feeding is also called as tube feeding.

Tube feeding : Tube feeding may be advised where the patient is unable to eat but the digestive system is functioning normally. Full fluid diets or commercial formulas may be administered through this route.

The tube may be passed through the nose into the stomach (nasogastric) duodenum (nasoduodenal) or jejunum (nasojejunal). When there is an obstruction in the oesophagus, enteral feeding is done by passing a tube surgically through an incision in the abdominal wall in to the stomach (gastrostomy) duodenum (duodenostomy) or jejunum (jejunostomy).

Indications for tube feeding

i. Inability to swallow due to paralysis of muscles of swallowing (diphtheria, poliomyelitis)

ii. Unwillingness to eat
iii. Persistent anorexia requiring forced feeding
iv. Semi conscious or unconscious patients
v. Severe malabsorption requiring administration of unpalatable formula
vi. Short bowel syndrome
vii. Babies of very low birth weight

Tubes: For enteral feeding for a short period of time locally available thin base nasogastric tubes are usually adequate. For prolonged use, specially prepared thin base, soft, flexible tubes are desirable.

Enteral feeds : The types of feeds that can be administered through a tube include

1. Blenderized feed : This is prepared for patients who cannot chew and swallow due to cancer of the oral cavity, larynx or oesophagus.

Ordinary food items which cannot be swallowed are cooked well and blenderized to make them liquid for feeding through a nasogastric tube.

2. Polymeric mixtures : Polymeric mixtures contain intact protein, fat and carbohydrate of high molecular weight and are thus lower in osmolarity and require normal digestive juices.

3. Elemental diets : Elemental diets are commercially predigested mixtures of amino acids, dextrins, sugars, electrolytes, vitamins and minerals with small amounts of fat.

The main indication for elemental diets is short bowel syndrome, till functional regeneration occurs in the residual bowel. These diets are used as alternatives to intravenous feeding. The disadvantages of this diet are high cost, unpleasant taste and sometimes high osmolarity. Therefore, easily digestible and more palatable preparations of casein and egg albumin are preferred.

To prevent essential fatty acid deficiency enteral feeds should provide 4% of total calories as essential fatty acids. Commercial enteral mixtures of varying osmolarity, digestibility, energy supply, lactose content, viscosity and fat content are available at pharmacies.

Methods of administration

The three common methods of tube feeding administrations are continuous drip, intermittent drip, bolus

1. Continuous drip : This is the most common form of administration. The drip rate is adjusted in increments to prevent cramping, nausea, diarrhoea or distention. Feedings are started at 30 to 50ml/hr every 8 or 12 hours until the final rate is attained.

2. Intermittent drip : In this 4-6 feeds are given with regular periods of interruption. For example 4 hours on and 4 hours off.

3. Bolus method : In this method large volumes are given in a short time. For example 200ml is administered in a minimum time of ten minutes.

Parenteral nutrition : The delivery of nutrients directly into the circulation through the peripheral or central vein is termed as parenteral nutrition. This can be total or supplemental.

The total substance of increased nutritional requirements through intravenous feeding has been termed as Total Parenteral Nutrition (TPN). When parenteral nutrition provides 30-50% of the total daily nutrients - it is termed as Partial Parenteral Nutrition (PPN). Intravenous feeding is best used in conditions when the patient cannot eat, will not eat, or cannot be fed adequately by tube feeding.

Conditions which necessitate parenteral feedig include:

1. Cancer
2. Inflammatory bowel disease
3. Short-bowel syndrome
4. Pre-operative conditions
5. Gasterointestinal fistulae.

Parenteral feed solution : The peripheral vein solution should be of less than 600 mol/ min. as higher osmolarity results in thrombosis and inflammation of the vein. The parenteral feed solutions contain.

1. Glucose
2. Emulsified fat
3. Crystalline aminoacids
4. Vitamins
5. Water
6. Electrolytes - Sodium, chloride, phosphorus, potassium, calcium and magnesium.
7. Trace elements - Zinc, copper, chromium, manganese and iodine

Advantages of enteral feeding over intravenous feeding

1. Convenient to administer
2. Inexpensive
3. No hospitalisation
4. No sterilization of tubes or nutrient
5. Expert supervision not necessary
6. Easily tolerated
7. Avoids Catheter related sepsis and infections
8. Avoids metabolic disturbances
9. Intestinal mucosa regenerate more rapidly.

Question

SECTION - A

I. A. Choose the correct answer

1. .... is a direct method of assessing nutritional status.

   a) Clinical examination b) Diet survey

   c) Assessing Socio-economic status

2. Weight gain is an indication of .... in children.

   a) Growth b) Development c) Growth and development

3. The average weight of an adolescent girl of 13-15 years is .... kg.

   a) 45.66 b) 47.88 c) 49.92

4. Linear measurement is of .... types.

   a) Two b) Three c) Four

5. The average height is a 16 year old boy is .... cm.

   a) 163.33 b) 168.40 c) 162.02

6. Rickets is a deficiency disease of vitamin ....

   a) B b) C c) D

7. Light diet is also called as

   a) Fluid diet b) Transitional diet c) Full liquid diet

8. Diet between full fluid and normal diet is called as ....

   a) Therapeutic diet b) Transitional diet c) Soft diet

9. For cancer patients .... method of feeding is suggested

   a) Parenteral feeding b) Tube feeding c) Enteral feeding

10. Zinc, copper, chromium, manganese are called as

    a) Trace elements b) Macro nutrients c) Macro elements

B. Answer in one or two sentences

1. Indirect method of assessing nutrition.
2. Types of linear measurements.
3. Vitamin A deficiency disease.
4. Write the method used to estimate haemoglobin
5. What is diet history?
6. when full fluid diet is recommended?
7. Tea with lemon, carbonated beverages are examples of which diet?
8. Name the common method of tube feeding.
9. What is Enteral feeding?
10. What is meant by TPN?

SECTION - B

II. Write in five lines

1. Write the importance of nutritional assessment.
2. Clinical signs of thiamine and niacin deficiency.
3. What is food expenditure pattern?
4. What is polymeric mixtures?
5. What is continuous drip?
6. Enumerate the conditions that necessitate parenteral feeding.
7. Write down the contents of the solution of parenteral feeding.
8. How do you modify the normal diet?
9. How do you take head circumference?
10. What are the factors to be considered while planning therapeutic diet?

SECTION - C

III. Write in one page

1. Explain the indirect methods of measuring nutritional status.
2. Tabulate the clinical signs and deficiency diseases.
3. What is a clear liquid diet. Explain with a day's plan.
4. Explain the common methods of tube feeding.
5. Define soft diet. Give a day's plan?
6. Explain vital statistics.
7. Advantages of Enteral feeding method.
8. Prepare a menu plan for full fluid diet.
9. What are the indications for tube feeding?

SECTION - D

IV. Write in detail

1. Define Therapeutic Diets. Explain its objectives. How will you plan and modify a normal diet to a Therapeutic diet.
2. Explain Enteral feeding.
3. How will you collect information on food consumption?

4. FOOD PRESERVATION

Food is the basic necessity of man and is invaluable for healthy existence. However most foods for consumption undergo deterioration and spoilage. In order to combat this problem fresh foods have to be preserved. Moreover when food is available in plenty it can be preserved for future consumption. Foods such as fruits and vegetables have a short growing season and preservation makes them available for use throughout the year and avoids wastage of surplus crops.

Food preservation

It can be defined as the science that deals with the process of prevention of decay or spoilage of food thus allowing it to be stored in a fit condition for future use. Preservation of food increases the shelf life of foods and thus ultimately ensures its supply during times of scarcity and natural drought.

4.1. Significance of food preservation

No food will stay indefinitely in its natural form. All natural foods are alive and like all other living materials they are subject to the process of deterioration and decay. These gradual changes in fresh foods are partly due to chemical changes in the living protoplasm of the food itself, usually catalysed by the cell enzymes and partly due to changes caused by minute organisms which get into the foods from outside.

Meat, fish and eggs may become putrified. Fats go rancid, milk goes sour, fruits go mouldy or ferment, vegetables become rotten, cereals go musty or germinate because of the action of enzymes. All natural foods are slowly and continually changing in character and composition. The appearance, smell, flavour and value of foods are generally being altered. Preservation of food concentrates on the prevention or slowing down of these changes.

Preserved Foods

Principles of food preservation

I Prevention or delay of microbial decompositions

a) By keeping out micro organisms – asepsis
b) By removal of micro organisms – filteration
c) By hindering the growth and activity of micro organisms – (low temperature, drying, chemical preservation).
d) By killing the micro organisms (heat or irradiation)

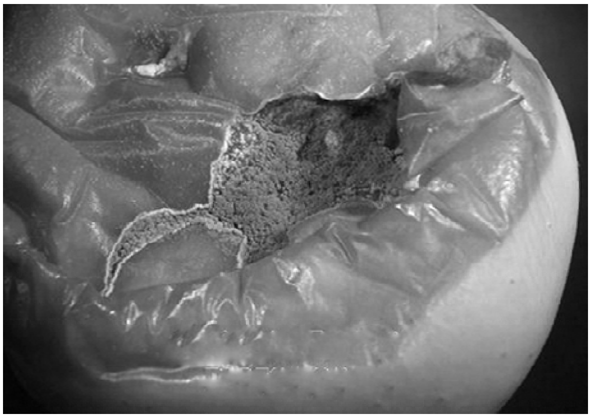
II Prevention or delay of self decomposition of food

a) By destruction or inactivation of food enzyme (eg – blanching)
b) By delay of chemical reactions (eg – prevention of oxidation by means of anti-oxidants.

III Prevention of damage caused by insects, animals and mechanical causes.

Food Spoilage

Food spoilage is a state in which food is deprived of its good or effective qualities. Deterioration or spoilage starts from the time food is harvested, slaughtered or manufactured and results in undesirable changes in the physical and chemical characteristics of food.



Spoiled food

Causes of food spoilage

1. Growth and activity of micro organisms such as bacteria, yeast and moulds
2. Activities of food enzymes and other chemical reactions within the food
3. Inappropriate temperatures for a given food
4. Gain or loss of moisture
5. Reaction with oxygen and light
6. Physical stress or abuse
7. Insects and rodents
8. Non –enzymic reactions in food such as oxidation and mechanical damage.

Reasons for food spoilage and methods of preservation are given in Table 4.1.

Table 4.1. Reasons for food spoilage and methods of preservation

S-No.	Reasons for food spoilage	Basic principles of food preservation	Methods of preservation
1.	Microbes naturally found in food or microbes that enter food due to improper handling and damage	Proper handling of food stuffs and creating hygienic environment.	Keeping out microorganisms (Asepsis).
2.	Reaction of enzymes in foods	Destruction or inactivation of food enzymes	Blanching, pressure cooking and sterilization.
3.	Improper temperature	Changing the temperature that spoils food	Refrigeration, freezing methods and using high temperature (cooking).
4.	Moisture and water content in food.	Removal of moisture and water from food.	Complete drying (Milk powder) Partial drying (Concentrated milk)
5.	Spoilage due to air	Removal of air	Canning, bottling and vaccum packing
6.	pH value and micro organisms	Changing the pH value that causes food spoilage	Addition of salt, sugar and chemical preservatives (eg) pickling, salted vegetable or fish, Jam, jelly, squash.

4.2. Methods of food preservation

A perusal of the history of food preservation reveals that food preservation had its beginning from time immemorial and should be traced to nearly a thousand years ago. Salting of meat, fish and vegetables was the oldest method of preservation and could be traced back to the ancient Egypt and Greek civilizations.

Pickling in salt and vinegar, sun drying and preservation of fruits and vegetables in sugar and honey were among the other methods used. Storage of food in frozen conditions were also practised for centuries in places where freezing temperatures were recorded.

The introduction of canning as a standard technique of preserving foods in sealed containers subjected to high temperature was established in 1810 by Nicholas Appert. In 1860 Louis Pasteur discovered that the microbes were the main cause of spoilage and introduced a heat treatment known as ‘Pasteurization’ to the world.

All the methods used for food preservation are based on preventing or retarding the cause of food spoilage. When growth of microorganisms is only retarded, preservation is temporary. When spoilage organisms are completely destroyed a more permanent preservation is achieved.

Methods of food preservation may be broadly classified as follows:

I. Physical methods

A. Preservation by low temperatures

1. Refrigeration
2. Freezing
   - (i) Slow freezing process
   - (ii) Quick freezing process
   - (iii) Dehydro freezing process

B) Preservation by high temperature

1. Pasteurisation
2. Canning

C) Preservation by drying

1. Sun drying
2. Drying by mechanical driers
   - (i) Spray drying
   - (ii) Foam mat drying
   - (iii) Drying by osmosis
   - (iv) Freeze drying

D. Preservation by irradiation

II. Chemical Methods

A. High concentration of salt (eg) Pickles

B. High concentration of sugar (eg) jam, jelly, marmalade, preserve

C. Using chemical preservatives (eg) Sodium benzoate, potassium metabi sulphite

III. By fermentation – Alcoholic fermentation (eg) wine, beer, toddy

I. Physical Methods

A. Preservation by low temperatures

1. Refrigeration (0^0C to 5^0C)

Chilling (refrigerator) temperatures are obtained and maintained by means of ice or mechanical refrigeration.

Frutis and vegetables, meat, poultry, fresh milk and milk products, fish and eggs can be preserved from two days to one week when held at this temperature.

In addition to the foods mentioned above, foods prepared for serving or left-overs may also be stored in the household refrigerator. The best storage temperature for many foods, eggs for example is slightly above 0^0C.

Low temperatures chiefly inhibit the growth of microorganisms but not permanently.

2. Freezing

Freezing may preserve foods for long periods of time provided the quality of food is good to begin with and the temperature is maintained in freezers. Some microorganisms are destroyed during freezing preservation. The preservative effect of freezing temperatures lies in the inability of microorganisms to grow at freezing temperatures.

In vegetables, enzyme action may still produce undesirable effects on flavour and texture during freezing. The enzymes therefore must be destroyed by heating before the vegetables are frozen.

i) Slow freezing process

It is also known as sharp freezing. In this method, the foods are placed in freezer cabinets at temperatures ranging from 4^oC to 29^oC. This method is adopted in home freezer. Freezing may require from 3 to 72 hours under such conditions.

ii) Quick freezing process

Very low temperatures of -32^oC to -40^oC are used to freeze foods rapidlyso that fine ice crystals are formed in a short period of time. The fine ice crystals formed by quick freezing have a lesser effect on breaking up plant and animal cells than slow freezing. In quick freezing large quantity of food can be frozen in a short period of time.

iii) Dehydro freezing

Dehydro freezing of fruits and vegetables consists of drying the food to about 50 per cent of its original weight and volume and freezing the food to preserve it.

The quality of dehydro frozen fruits and vegetables is equal to that of fruits and vegetables frozen without preliminary drying. The cost of packing, freezing, storing and shipping of such foods is less because of the reduction in weight and volume of foods during dehydro-freezing.

B. Preservation by high temperatures

1. Pasteurization

Pasteurization is a heat treatment that kills part but not all the microorganisms present and usually involves the application of temperatures below 100^oC. The heating may be by means of steam, hot water or dry heat and the products are cooled promptly after the heat treatment. Usually milk and fruit juices are pasteurized.

2. Canning

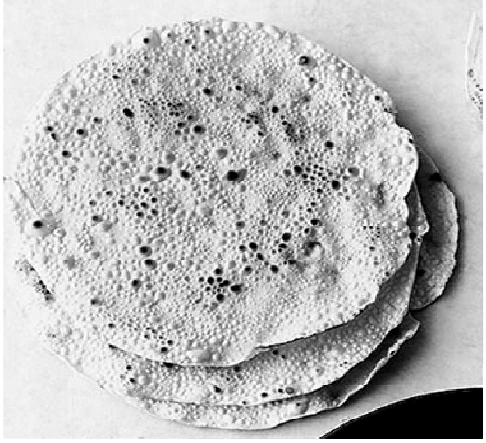
Canning involves the application of temperatures to food that are high enough to destroy essentially all the microorganisms present plus air tight sealing in sterilized containers to prevent contamination. Fruits, vegetables and fleshy foods are preserved by this method.

Canned Foods

The canning process includes the following steps:

1. Cleaning – Thorough cleaning of the food
2. Blanching – Immersion of raw materials into hot water or exposure to live steam
3. Filling - Filling the can with food along with sugar syrup or brine solution leaving a head space on top.
4. Exhausting – Air is expelled by passing through hot water or steam and vaccum is created
5. Sealing the container – containers are sealed using sealing machines
6. Sterilising - Sterilising the sealed container with its contents by the application of steam under pressure to prevent spoilage of the food by microorganisms
7. Cooling - Immediate cooling to prevent unnecessary softening of the food or change in colour of the contents. It is done by means of cold air or water.

C. Preservation by drying



Microorganisms need moisture to grow. When exposed to sunlight or subjected to dehydration, the moisture in the food is removed and the concentration of water is brought below certain level. This prevents the growth of microorganisams and thereby prevents spoilage of food.

Food preservation by drying is one of the oldest method practised from ancient times. This method consists of exposing the food to sunlight or hot air until the product is dry.

Treatment of foods before drying

- Selection and sorting for size, maturity and wholesomeness
- Washing especially of fruits and vegetables
- Peeling of fruits and vegetables by hand, machine or abrasion

- Subdivision into halves, slices, shreds or cubes
- Blanching or scalding of vegetables and some fruits

Methods of Drying

1) Sundrying

Many foods are preserved by sundrying in India. Papads and vathals are made using this principle. Vegetables like cluster beans and chilli and fruits like grapes, raw mango and jack fruit are preserved by this method. Fish and meat are also sun dried.

2) Drying by mechanical driers

Most methods of artificial drying involve the passage of heated air with controlled relative humidity over the food to be dried or the passage of the food through such hot air. Fruits, vegetables, nuts, fish and meat can be successfully preserved by this method. In the dehydration process artificial drying methods (e.g. spray drier) are used for drying foods.

i) Spray drying

Milk and eggs are dried to a powder in spray driers in which the liquid is atomized and sprayed into a hot air stream or almost instant drying.

ii) Foam mat drying

Foam mat drying may be used commercially with orange and tomato juice. In this process a small amount of edible foam stabilizer is used. The foam is spread in a thin layer and dried in a steam of hot air. The product gets separated easily into small particles on cooling.

iii) Drying by osmosis

Drying by osmosis results when fish is heavily salted. In this case, the moisture is drawn out from all the cell tissues. The water is then bound with the solute making it unavailable to the microorganisms. In osmotic dehydration of fruits, the method involves the partial dehydration of fruits by osmosis in a concentrated sugar solution or syrup.

iv) Freeze drying

Removal of water from a frozen product by sublimation is called freeze drying. Freeze dried foods will be of superior quality with light and porous texture.

D. Preservation by irradiation

Food irradiation is a process of food preservation in which the food is exposed to ionizing energy from radio isotope cobalt 60.

The potential uses of food irradiation are

- To extend the storage life of cereals and spices by avoiding the use of harmful chemical compounds like methyl bromide and ethylene-di-oxide for insect disinfestations in stored products.
- To extend the shelf life of meat, poultry and sea foods by killing microorganisms causing spoilage.
- To enhance safety of food by killing food borne pathogenic microorganisms and parasites.
- Food irradiation reduces post harvest storage losses. Irradiation at the appropriate level does not change the flavour, taste, smell, texture and nutrient

contents of foods. Irradiated foods are safe and wholesome for human consumption if properly done.

II. Chemical Methods

A. High concentration of salt

Salt is used to control microbial population in foods such as butter, cheese, vegetables, meat and fish. Spices and other condiments have bacteriostatic effect. In addition to salt, several spices and oils are used in making pickles.

Aerobic bacteria and mold growth are prevented by covering the top of the pickle with oil. Properly prepared and stored pickles can last upto one year or more without spoilage. The important preservative agents in pickles are salt, vinegar, sugar, oil, spices and condiments.

B. High concentration of sugar

Apples, guavas, grapes and pineapples are suitable for making jams and jellies.The fruits should be just ripe because the pectin content is high in such fruits.

C. Using chemical preservatives

Preservative has been defined as chemical agents which serve to retard, hinder or mask undesirable change in food. These changes may be caused by microorganisms, by the enzymes of food or by purely chemical reaction.

Prevention of Food Adulteration Act (PFA) classifies them as class I preservatives and class II preservatives. Class I preservatives are salt, sugar, spices, vinegar, honey and edible vegetable oils. Class II preservatives are potassium metabisulphite, benzoic acid and its sodium and potassium salts. The preservatives generally used in fruit and vegetable products may be broadly classified as organic and inorganic preservatives.

Question

SECTION - A

I. A. Choose the correct answer

1. Keeping out microorganisms is called ....

   a) Filtration b) Asepsis c) Radiation

2. Pasteurisation is a method of preservation using

   a) Sun drying b) High temperature c) Low temperature

3. High concentration of sugar is used in preparing

   a) Jam b) Wine c) Ketchup

4. The chilling temperature in mechanical refrigerator is

   a) 5^0C - 10^0C b) 10^0C - 15^0C c) 0^0C - 5^0C

5. Properly prepared and stored pickles can be preserved upto

   a) One year b) 2 months c) 6 months

6. Complete killing of microorganisam is obtained by

   a) Filtration b) Radiation c) Blanching

7. .... is the oldest method of preservation

   a) Freezing b) Salting c) Canning

8. Microorganisms need .... to grow.

   a) Moisture b) Salt c) Canning

9. .... may be used commercially with orange and tomato juice.

   a) Freeze drying b) Irradiation c) Foam mat drying

10. Alcoholic drinks are prepared by using .... process.

    a) Drying b) Irradiation c) Fermentation

B. Answer in one or two sentences

1. What is asepsis?
2. What is filtration?
3. What is blanching?
4. Which is the oldest method of preservation?
5. Who discovered "Pasteurisation" method?
6. List the freezing methods.
7. Write any two chemical preservatives.
8. Write the temperature used for slow freezing process.
9. List any two foods that can be preserved by canning.
10. Write any two dried products.

SECTION - B

II. Write in five lines

1. Define food preservation.
2. List any 4 causes of food spoilage.
3. Define food spoilage.
4. Write on refrigeration.
5. What is pasteurization?
6. What is quick freezing process?
7. Define canning.
8. What is drying by osmosis?
9. How do you classify chemical preservatives?
10. How salt is used in preservation?

SECTION - C

III. Write in one page

1. What is food preservation and write the significance.?
2. Write on the principles of food preservation.
3. Define food spoilage and write on the causes.
4. Classify food preservation.
5. Describe the physical methods of preservation.
6. Bring out the types of freezing process.
7. Explain canning technique.
8. Write on chemical methods.
9. Explain the various types of mechanical driers.
10. What are the uses of irradiation method in food preservation.

SECTION - D

IV. Write in detail

1. Bring out the reasons for food spoilage, principles and methods of preservation.
2. Classify the different methods of preservation.
3. Write on preserving foods by using high and low temperature.
4. Explain drying methods of preservation.
5. Write in detail about using chemical methods in preservation.

5. SALTING AND FERMENTATION

5.1 Salting

Salt is used to control microbial population in foods such as butter, cheese, vegetables, meat, fish and bread. Spices and other condiments have bacterorstatic effect. In addition to salt, several spices and oils are used in making pickles.

Pickling

The preservation of fruits and vegetables in common salt, vinegar, oil and spices is referred to as pickling. Salt binds the moisture in the food thereby prevents the growth of micro organisms.

Salted and Pickled Vegetables

Pickles are good appetizers and add to the palatability of a meal. They aid in digestion by stimulating the flow of gastric juices. Very little scientific data is available regarding their nutritive value. Different kinds of pickles contain varying amounts of nutrients depending upon the raw material taken and the method of preparation. For (eg) The food value of cucumber pickle exceeds that of rice, fresh onions and fresh tomatoes.

Ingredients needed for preparing pickles

Ingredients used in pickling should possess certain definite characters.

a. Salt

For pickling any variety of vegetables, common salt is suitable, provided it is pure. Salt should be free from lime (CaO_3) as it reduces the acidity of the vinegar in which brined vegetables are packed. Vegetables do not ferment when they are strongly brined by large quantity of salt. Spoilage of pickle is prevented by adding sufficient amount of common salt.

b. Vinegar

Vinegar acts as a preservative. To avoid dilution of the vinegar by the water liberated from the tissues, the vegetables are generally placed in strong vinegar of about 10 per cent acidity for several days before pickling.

c. Sugar

Sugar used in the preparation of sweet pickles should be of high quality.

d. Spices

Spices are generally added to all the pickles but the quantity added depends upon the kind of fruit or vegetable taken and the kind of flavour desired. Spices generally used are cardamom, chillies, cinnamon, clove, coriander seeds, pepper, garlic, turmeric, ginger, mint, mustard, cumin and fenugreek seeds.

e. Water

Only potable water should be used for the preparation of brine. Hard water interferes with the normal salt curing of the vegetable.

f. Colouring and hardening agent

Natural colouring agent, turmeric is commonly used in pickles, sauces and ketch ups. Artificial colours are not generally added to pickle, although they may be used to some extent. Alum is used sometimes for firmness in pickles.

Common methods of Preparing Pickles at Home

There are several kinds of pickles sold in the market. Fruits and vegetables used for making pickle should be fresh, ripe and without spoilage since the quality of pickle depends on the ingredients used. The vegetables should be cut into small pieces and soaked in salt water for 12 hours. If they are soaked in cold water, the vegetables or fruit should be immersed in the solution. If dry salt is used the vegetables should be kept in layers in deep porcelin vessel and salt is sprinkled in between layers. The salt is added layer by layer till the jar is three quarters full. Then one or two folds of cheese cloth are spread over the salted vegetables and keep the wooden board on the top of it. After packing the vegetable the jar is placed in a warm and dry place and fermentation is allowed to proceed. Within a few days due to osmosis, juice from the vegetables forms the brine covering the whole mass.

Types of pickles : There are five types of pickles.

a) Salt pickles : Salt pickle adds taste to food and enhances digestive ability. The method of preparation involves addition of salt to vegetable and fruit pieces and allowing to soak till they are softened.

b) Spiced pickle : This type of pickle is more tastier since oil and spices are added for seasoning and preservation. Spoilage of pickle is prevented by the addition of salt and spices.

c) Pickles preserved by lemon juice : Vegetables and garlic pickles are preserved with lime juice which adds taste to the pickle.

d) Vinegar pickle : Vinegar is a dilute acetic acid. Vinegar is used as a preservative for preparing tomato sauces, tomato pickle, chilli sauce and meat pickle.

e) Sweet pickle : Sweet pickle is prepared by adding garam masala powder and sugar to fruits and sweet vegetables. Vegetables and fruits should be soaked in sweet vinegar and boiled for 5 to 6 minutes and mixed well, cooled and placed it in the jar.

Though there are a variety of pickles the scientific principle underlying their preparations are practically similar in all the cases.

Types of spoilage in Pickles

Different kinds of spoilages occur in different types of pickles which are dealt briefly in the following paragraphs.

1. Shrivelling: Shrivelling occurs when vegetables like cucumber are placed directly in a very strong solution of salt or sugar and in very strong vinegar. To avoid this, weak solutions should be used to start with, increasing their strength gradually.

2. Bitter taste: This results from the use of strong vinegar. It can also be caused by cooking the spices for a long time and also by overspicing.

3. Blackening: This is caused by iron, which enters through the brine or from the equipment. Sometimes specific organisms also cause blackening.

4. Dull and faded products: Pickles become dull and faded due to either insufficient curing or use of ingredients of inferior quality.

5. Softness and slipperiness: This is owing to the action of photo bacteria and is the most common form of spoilage. It is invariably due to inadequate soaking with brine or the use of a weak brine. By using a brine of proper strength and by keeping the pickle well below the surface of the brine, this kind of spoilage can be eliminated.

6. Scum formation: When vegetables are placed in the brine for curing, a white scum is invariably formed on the surface owing to the growth of wild yeast. This scum may be thin or thick in appearance, varying from almost impermeable film to a thick wrinkled layer which may help in the growth of putrefactive bacteria, which causes the vegetables to become soft and slippery.

7. Cloudiness: When vegetables are placed in vinegar it is generally presumed that the products will not spoil. In the case of onion and some other vegetables however sometimes the vinegar becomes cloudy and turbid, thereby spoiling the appearance of the pickle. Cloudiness may also be caused by chemical reaction between vinegar and the minerals such as calcium, magnesium or iron.

8. Blemishes: Blemishes may sometimes occur in the pickles especially in onion pickles in vinegar. In the case of onion, a white patch is sometimes seen under the first layer of the skin. This appears to be owing either to some kind of fermentation or non removal of all the brine prior to the final pickling of cured onions in vinegar.

9. Change in the shape of pickle: The vegetables used for pickling should be dried well before using so that the shape is retained. The main reason for deformation is due to excess use of vinegar. Normally 4 per cent vinegar can be used.

10. Fungal attack: If sufficient salt, chilli powder, masala powder and oil are not used, fungal attack occurs. To avoid this sufficient drying is needed. Moreover there should be 1 or 2 inches of oil above the pickles and adequate salting is also essential. The jar used to store the pickle should be moisture free and small cups and wooden spoons should be used for taking the pickle from the jar.

Things needed for making pickles

Knife, spoon, basin, jars, air tight containers, cooking vessels, kadai.

5.2. Fermentation

Fermentation is one of the age old method of food preservation techniques. Fermentation extends the shelf life of the foods similar to that of salting and drying. In times of scarcity and non-availability of foods the fermented foods can be used.

Fermentation is a process by which carbon containing compounds are decomposed or broken down in an energy-yielding process in aerobic or anaerobic condition. Fermentation means the process of the reaction between microorganisms and organic compounds in natural conditions. Apart from carbohydrate, microorganisms and enzymes react on protein and fat, then releases carbon-di-oxide and other gases.

(1) Anaerobic condition: Due to Streptococcus Lactis bacteria, lactose is converted to lactic acid in the anaerobic condition

(2) Aerobic condition : Due to Acetobactor bacteria ethyl alcohol is oxidised to acetic acid in aerobic condition.

Factors influencing the nutritional value of fermented foods : Fermented foods are highly nutritious than other foods. It is done by the following three factors.

1. Mold or Fungi : Fermentation process helps in release of the nutrients from the cells in the food stuffs. Molds break and release the nutrients from the undigested cells (cellulose). Mold contains enzymes which helps in changing fibre into sugars. In the same way, yeast, bacteria and enzymes make nutrients available to us.

2. Microorganisms : Microorganisms cause not only digestion but also metabolism. Microorganisms produce vitamins and growth factors.

3. Enzymes : Microbial enzymes help in producing nutrients from plant foods.

Changes during fermentation

Changes in foods due to microorganisms are divided into three types.

(i) Proteolysis : Proteolytic microorganisms break down protein and other nitrogenous products and release decomposed odour.

(ii) Lipolysis : Lipolytic microorganisms reacts with fat and produces rancidity, which cause a fishy odour.

(iii) Fermentation : Fermentative microorganisms change carbohydrate foods to alcohol, acid and carbon-di-oxide. These types of foods are consumable.

Types of fermentation

Based on the fermented products fermentation process is divided into two.

Fermentation

Fermentation to alcohol	**Fermentation to acid**
1. Bread	1. Milk products
2. Beer	Cheese
3. Wine	Butter
	Yogurt
	2. Vegetable pickles
	3. Vinegar

Uses of Fermentation

- Fermentation is a method of extending the shelf life of foods.
- The process of fermentation enhances the growth of microorganisms producing acid and alcohol and preventing the growth of lipolytic and proteolytic microorganisms.
- Many alcoholic beverages are produced by fermentation.
- Lactic acid bacteria convert lactose in milk to lactic acid, resulting in the production of milk products such as curd, yoghurt and cheese. Vinegar obtained by fermentation has gained industrial importance in preserving foods.
- Bread, bun, sweet doughs are prepared by fermentation.

Foods produced by fermentation

1. Wine : Yeast is present on the skin of grapes. Fermentation process starts when yeast reacts with the sugars of grapes to convert them into alcohol.

2. Beer and Ale : These contain malted cereals which are fermented by yeast to yield 3-7% of alcohol. The type of yeast, quantity and fermentation temperature control the alcohol production.

3. Vinegar Preparation : In the presence of oxygen, acetobactor bacteria converts alcohol to acetic acid. In this way, vinegar is prepared.

4. Cheese Production : Streptococcus lactis bacteria changes milk sugar into lactic acid. This acid curdles milk into cheese. Many types of cheese can be produced.

Cheese

5. Citric acid Production : Citric acid is produced from yeast, mold and bacteria. It is used in the production of fruit beverages, soap industry and pharmaceuticals. It is used mostly for eliminating poisonous gases from air.

6. Bread Production : In bread production fermentation is done in the following steps.

1. Starch $\xrightarrow{\text{starchy enzymes}}$ Maltose
2. Maltose $\xrightarrow{\text{yeast enzymes}}$ Glucose
3. Glucose $\xrightarrow{\text{yeast enzymes}}$ Alcohol

Baker's yeast is used for making bread. During fermentation Co_2 and alcohol are produced. During baking Co_2 and alcohol increases the volume of bread and softens it.

Factors controlling fermentation

1. Volume of acid
2. Volume of alcohol
3. Starter culture
4. Temperature
5. Volume of oxygen
6. Salt

5.3. Food Industry - Hygiene and Sanitary Practices

Cleanliness of food Industry ranks high among the concerns of customers and often influences their decision to return to a restaurant. Maintenance of equipment and facilities is important other than sanitation too. The safety of surroundings is often related to cleanliness and maintenance practices. A properly designed food industry facility is basic for maintenance of high standard of sanitation. Equipment and fixtures should be arranged and designed to comply with sanitation standard. Garbage should be isolated to avoid contaminating food and attracting pests. A quality product made in a clean atmosphere as well as handled in a sanitary manner will definintely have more customer appeal.

Clean : means free of soil and with an outwardly pleasing appearance.

Sanitation : means free of disease causing organisms and other contaminants. Sanitation can be briefly defined as the cleanliness of surroundings and machines and hygiene as the cleanliness of the persons and the way they handle things.

Hygiene and Sanitation

To assess the hygiene and sanitation requirement of a food establishment it is important to look at its various aspects separately as shown in Table 5.1

Table 5.1: Hygiene in Food Industry

Hygiene and Sanitation		
Environmental Hygiene	**Hygienic Food Handling**	**Personnel Hygiene**
Site Structure Equipment, furniture and fitting Ventilation Lighting Water supply Waste disposal	Receiving Storing Preparing Cooking Serving Cleaning Disposing	Dress Grooming Health Habits

Advantages of cleanliness

1. Production : The maintenance of a clean, well lighted ventilated food industry (either Bakery unit, cafeteria etc.) will definitely increase the efficiency of operation. The employees will be more careful about their work and will be surely be proud of their profession. Maintenance of cleanliness facilitate reduction of waste, improvement in quality and quantity of output.

2. Sales : If the food inudstry is kept spotlessly clean it is an advertisement to boost up sales. Extreme care is taken to make good food available everfresh everyday. Nothing impress the customer more than thorough cleanliness and neatness.

3. Minimising risk: Good hygienic conditions in a food industry minimises the risk and enhances the profit. The raw materials and processing machineries should ensure good sanitation to minimise risk. Immediate disposal of the waste will avoid the risk of contamination.

4. Working premises: Floors in the working areas should be strong enough to withstand great deal of traffic as well as the weight of the equipment. The floor should be easility cleanable. The junctions of the wall should have curved corners for ease in cleaning and walls should be durable, smooth, impervious and washable to prevent dirt, cobweb, flour dust and they should be lightly coloured with adequate ventilation, entrance door should be

insect proof, good lighting is essential in all parts of the premises for proper food preparation avoiding dirt.

5. Raw material: Standardised food substance (eg. BIS and FPO standard) should be used. Basic substances used for preparation should be preserved properly. Adequate water facility is essential. Bacteria and microorganism that cause infectious diseases should be avoided.

6. First aid kit: Customer safety is the responsibility of the food industry. They should have complete first aid kit to avoid any emergency mishap that happens in the unit. Safe and healthful working conditions are mandatory as per Occupational Safety and Health Act (OSHA) introduced in 1970. It indicates that every worker should have safe and healthful working conditions and to preserve human resources. Fire is a particular hazard with food service industry because of the nature of a business. Fire extinguishers should be used before calling the fire service department. Safety training must have major emphasis in both initial and in-service employee training programmes.

Hygiene and sanitation is a continuous but essential process which needs serious and constant consideration at all times.

Personal Hygiene

1. Keep the hands clean, wash with warm soapy water frequently and dry with tissue paper.
2. Washing hands is a must in the following conditions.
   - After using toilet
   - Between handling raw and cooked foods to avoid contamination
   - After blowing the nose, sneezing, coughing
   - After eating
   - After touching the face, hair
3. Keep finger nails clean and well trimmed.
4. Keep uniform clean and use a clean apron
5. Keep hair neat and clean, use hair net / caps, no loose hair
6. No eating in food preparation area
7. Handling of food should be minimized, use hand gloves or spoons
8. If sick or ill stay separately
9. If there is wound in hand do not handle food
10. Keep the cooked foods covered and stored.

Question

SECTION - A

I. A. Choose the correct answer

1. The ingredients used in pickling includes:

   a) Salt, vinegar b) Spices, water c) Oil alone

2. Natural colouring agent is ....

   a) Turmeric b) Cinnamon c) Vinegar

3. Garlic pickles are preserved by ....

   a) Vinegar b) Lime juice c) Sugar

4. Blackening in pickle is caused by

   a) Lime b) Iron c) Vinegar

5. Vinegar is a dilute ....

   a) Sulphuric acid b) Acetic acid c) Hydro Chloric acid

6. Softness of pickles occurs due to

   a) Bacteria b) Photo bacteria c) Acetobacteria

7. Fungal attack can be avoided by

   a) Drying b) Salting c) Pickling

8. Fermentation is of .... types

   a) Three b) Two c) Four

9. Acid used in fruit beverages and pharmaceuticals.

   a) Citric acid b) Acetic acid c) Hydrochloric acid

10. Fungal attack in pickles is due to more

   a) Oil b) Salt c) Moisture

B. Answer in one or two sentences

1. Define pickling.
2. Name the types of pickles.
3. Write down the ingredients needed for making pickles.
4. Define fermentation.
5. Name the agents bringing about bacteriostatic effect?
6. Define proteolysis.
7. What is meant by sanitation?
8. Cause for firmness in pickle.
9. What are standardised food substances?
10. Cleanliness - define.

SECTION - B

II. Write in five lines

1. Sweet pickle.
2. Mold or fungi.
3. Uses of fermentation
4. Factors controlling fermentation.
5. Steps in bread making.
6. Types of fermentation.
7. Citric acid production.
8. Vinegar.
9. Scum formation.
10. Colouring agent.

SECTION - C

III. Write in one page

1. Write down the ingredients needed for preparing pickles?
2. Factors influencing the nutritional value of fermented foods.
3. List down the foods produced by fermentation?
4. Tabulate the hygienic practices in food industry.
5. Explain the types of pickle.

SECTION - D

IV. Write in detail

1. Explain the different types of spoilage in pickles.
2. What is fermentation, write down the uses and types of food preservation?
3. Write down the importance of cleanliness in food industry.

6. BAKERY

Baking refers to the operation of heating dough products in an oven. Baking means all the science and technology that must precede the oven as well as the oven-heating.

6.1. Types of Bakery Products

Classification : Bakery products can be classified into four categories according to the way in which they are leavened.

No.	Method of leavening	Examples of bakery products	Leavening agent
I	Yeast raised	Breads and Sweet doughs	Leavened by carbon-di-oxide
II	Chemically leavened	Layer cakes, Dough nuts and Biscuits	Leavened by carbon-di-oxide from baking powders and chemical agents
III	Air-leavened	Angel cakes and Sponge cakes	Incorporating air into egg, sugar and flour mixture without baking powder
IV	Partially leavened	Pie crusts and certain crackers	No leavening agents are used

Principles of Baking : Baking is a heating process in which many reactions occur at different rates. Some of these reactions include the following :

1. Evolution and expansion of gases
2. Coagulation of gluten and eggs and gelatinization of starch
3. Partial dehydration from evaporation of water
4. Development of flavours
5. Changes of colour due to Maillard browning reactions between milk, gluten and egg proteins with reducing sugars, as well as other chemical changes.
6. Crust formation from surface dehydration
7. Crust darkening from Maillard browning reactions and caramalization of sugars.

Types

1. Bread
2. Cakes
3. Bun
4. Pastries
5. Biscuits
6. Cookies
7. Doughnuts
8. Crackers

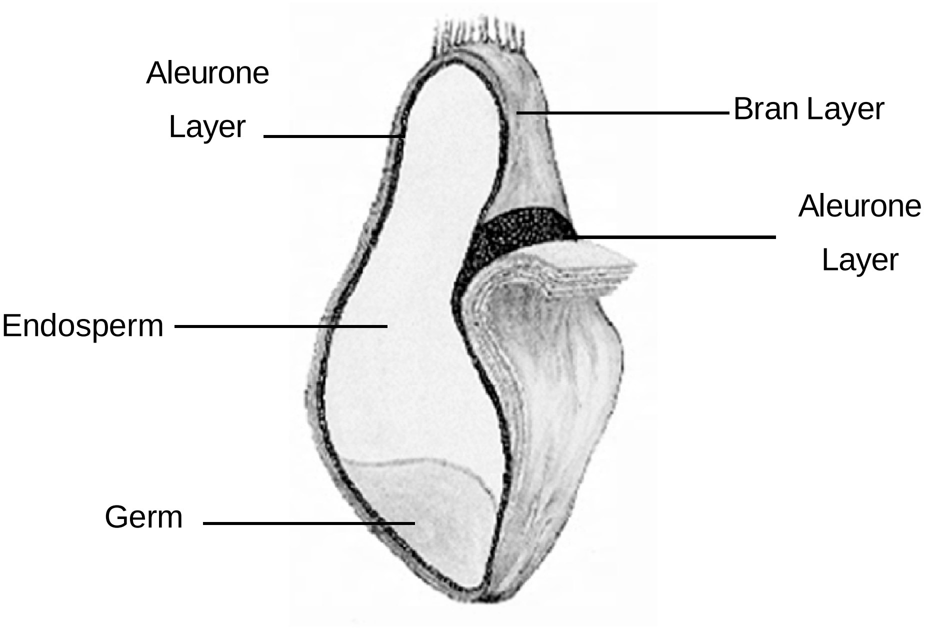
6.2. Baking Ingredients

1.	Wheat flour	5.	Eggs
2.	Leavening agents	6.	Shortening
3.	Yeast	7.	Sugar
4.	Baking powder		

1. Wheat Flour

Wheat is used principally for human consumption. It is converted into flour for the production of bread and other bakery products.

Structure of wheat : Wheat grains are composed of outer bran coats, a germ and starchy endosperm.



Structure of Wheat

Bran : Bran is the outer layer of the kernel and constitutes 5 percent of the kernel. During milling the bran is discarded. Bran is rich in fibre and minerals. It is also a good source of thiamine and riboflavin.

Aleurone Layer : This is located just under the bran, which is rich in protein, phosphorous and thiamin and contains moderate amount of fat. The aleurone layer makes up about 8 percent of the whole kernel. This layer is lost in the milling process along with bran.

Endosperm : This is the large central part of the kernel and constitutes 84-85 percent of the kernel. The endosperm cell consists mainly of starch and protein and little mineral matter and fibre and only a traces of fat. The vitamin content of the endosperm is low.

Germ : This is a small structure at the lower end of the kernel and is separated from the endosperm by the scutellum. It makes up 2-3 percent of the whole kernel. It is rich in protein, fat, vitamins and minerals. Germ serves as a store of nutrients for the seed during germination. During milling some of the germ is lost along with the bran and aleuron layer.

Uses of wheat : Wheat contains 6-18 per cent of protein. Wheat flour contains glutelin and gliadin as proteins which are commonly known as gluten. The strength of the wheat flour is based on the quality of gluten used. Wheat flour is essential for making bakery products like cake and bread. The whole wheat flour is obtained by grinding the whole wheat, if it is refined, it is called as maida, it is more bland in taste and more easily digested. It is used in the manufacture of pasta products like macaroni, vermicelli and noodles. If it is coarsely ground, it is called as semolina or ravai.

Wheat flour is a good source for making supplementary nutritious foods for children. Husk of wheat is used as feed in animal husbandary and poultry.

Wheat types : Wheat may be classified as hard or soft and as strong or weak.

Hard wheat : Hardness is related to the degree of adhesion between starch and protein. In hard wheat fragmentation of the endosperm tends to occur along the lines of the cell boundaries. Hard wheat yield coarse flour and is a good source of gluten.

Soft wheat : In this type, the endosperm fractures in a random way. Soft wheats give very fine flour and contains good quality gluten but less amount. The strength of wheat is related to its baking quality.

Strong wheat : This produce large loaf volume, good crumb structure and good keeping qualities. Such wheat have a high protein content. Hard wheats are employed for the production of flour for making high quality bread.

Weak wheat : This has a low protein content and form only a small loaf with coarse crumb structure. The flours of weak wheats are good for biscuits and cakes. Depending upon the nature of the baked product, different types of flour are milled.

1. Wheat Flour

Some of the types of flours used for baking are as follows:

a. Bread flour : Bread flours should have a high protein content. They are milled from blends of hard wheat. Their moisture content, protein content, starch quality are all controlled. Bread flours are used mainly for making products leavened with yeast.

b. Soft flour : It is used for making all types of high quality cakes and spongy cakes.

c. Self raising flour : A mixture of wheat flour and sodium carbonate is known as self raising flour. This flour is sieved and used domestically for making puddings, cakes, pastries etc. The moisture content of the flour should not exceed 13.5 per cent, in order to prevent premature reaction between the chemicals present in the flour. A slight excess of bi-carbonbate gives rise to an unpleasant odour and brownish yellow colouration.

d. All purpose flour : It is made from blend of hard and soft wheats and has a moderate protein content. It does not contain self raising agents, it is suitable for use in the yeast and quick breads, biscuits, pastries and cakes.

e. Biscuit flour : Biscuit flour is made from weak wheat of low protein content. Depending on the type of biscuit, special types of flours are made. The flour should make a dough

having more extensibility, but less spring (resistance) than bread dough. Dough pieces should retain their size and shape after being stamped out.

f. Cake flour : Cake flour is a medium strength flour ground from soft low protein wheat of fine structure. The purpose of flour in cakes is to allow an aerated structure to be retained after the cake has been built up.

g. Pastry flour : Pastry flours are similar to cake flour and made of soft wheat and are fairly low in protein. They are finely ground and they can be used for all baked products other than breads.

The principal functional protein of wheat flour is gluten. Gluten has the important property that when it is moistened and worked by mechanical action, it forms linkages between protein molecules. The character of a dough or batter depends considerably on the type of flour used. Strong flours containing more gluten are the kind chosen for making bread because bread dough must be able to expand to a greater degree and light density. Weaker flours are for cakes and related products, in which their films tear more readily and when it is baked it turns in to less chewy and more tender.

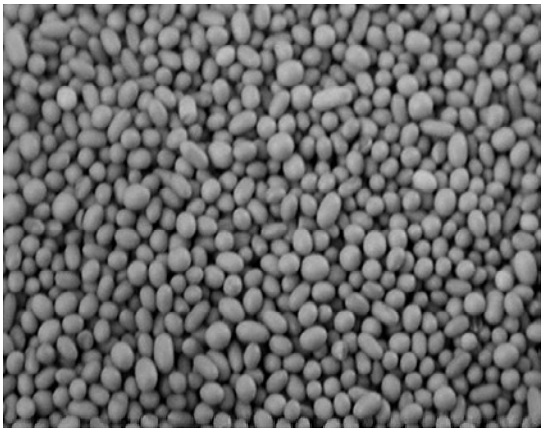
2. Leavening agents :

The important leavening agents are as follows:

a) Yeast
b) Baking powder
c) Steam obtained from heating of the dough in the oven
d) Air in a dough or batter expands in the oven while heated
e) Carbon-di-oxide from fermenation.

3. Yeast :

Two forms of yeasts are used in baking namely, moist compressed yeast and active dry yeast. In the bread making process yeast ferments simple sugars and produces carbon-di-oxide and alcohol. This fermentation is gradual, beginning slowly and increasing in rate with time.


Yeast Granules

The increase in fermentation rate with time is due to two conditions in a dough.

a) Yeast cells are multiplying and their enzymes are becoming more active while the dough is prepared and held.
b) Sugar for fermentation is gradually being liberated from starch in the dough by the action of natural flour enzymes.

4. Baking Powders

Baking powders used in making cakes and related foods contain particles of sodium bi-carbonate. Baking powders are formulated to produce controlled release of gas for specific bakery product application. Baking powders are of three kinds : fast or slow acting and double acting powders (contain both fast and slow acting in combination with sodium bi-carbonate).

5. Eggs

In addition to their nutrient, flavour and colour contributions, eggs can function as a principal structure builder in cakes. Like gluten, egg white is a mixture of proteins. It forms films and entraps air when it is whipped and on heating it coagulates to produce rigidity. The whipping quality and foam stability of eggs are very important to the baker.

6. Shortenings

Shortenings are fats and oils. Butter is the most common shortening. Unlike flour and eggs, which are structure builders and tougheners, shortening is a tenderizer. When the batter is baked in the oven, the shortening melts and releases the air bubbles which help in the leavening action of baking powder and expanding steam. The cellular structure of a cake and cake volume are affected by the number and size of air bubbles and water droplets in the beaten shortening.

7. Sugar

Sugar like shortening, is a tenderizer in baked foods. It is necessary for yeast growth and indirectly for fermentation process. Brown colour of the crust is due to the Maillard reaction between the protein and sugar which occurs during baking. It influences the tenderness and the volume of baked products. Honey and glucose are also used in baked products.

8. Other ingredients

Milk powder and skimmed milk are used in bread and bun making. It increases the nutritive value of bread. It improves flavour and gives a brown crust.

Oxidising agents like potassium bromate, potassium iodate and calcium peroxide are used to improve the handling characteristics of the dough and specific volume and texture of the finished products.

Salt has a retarding effect on yeast fermentation. Salt is used as a flavouring agent.

Water is important for gluten formation. It dissolves sugar and salt and serves as a dispersion media for yeast cell.

6.3. Bread Making

Bread is produced by making a dough from wheat flour and aerating this with carbon-di-oxide produced by yeast fermentation.

Bread making ingredients could be divided into two categories:

1. Essential : Flour, wheat, yeast and salt

2. Optional : Sugar, fat, milk and milk products

Flour : Flour for bread making should have a creamy white appearance, free from any bran fragments. It must have good water absorption power and have sufficient strength to produce a bold loaf. The main constituents of flour are starch, protein - soluble and insoluble, moisture

The starch of bread making flour should have sufficient diastatic capacity ie., capacity to convert starch into sugar which is essential for the bread in acquiring volume.

Insoluble proteins of flour are glutelin and gliadin which upon coming in contact with water form gluten. This gluten is responsible for building structure of bread.

The moisture in bread-making flour should be about 15 per cent.

Yeast : Yeast causes fermentation producing carbon-di-oxide gas which raises the dough fabric. This action is brought about by enzymic action. Strong flours require longer fermentation time than weak flours.

Water : Water binds together the insoluble proteins of flour which form gluten. Any water which is potable (fit to drink) can be used for bread making.

Salt : Salt imparts taste and flavour to bread. It controls the yeast activity and thus keeping the fermentation speed under check.

Sugar : The main function of sugar in bread making is to provide food for yeast and helps to impart the golden brown colour to the bread.

Fat : Fat improves the nutritional value of bread

Milk : It improves the nutritional value and has a beneficial effect on the physical qualities of bread.

Bread-making methods : After the raw material for bread making is correctly selected, the raw material should be weighed accurately and mixed.

The different bread making methods are as follows :

1. Straight dough method
2. Salt-delayed method
3. No dough time method
4. Sponge and dough method
5. Ferment and dough process.

1. Straight dough method : In this method, all the ingredients are mixed together. The resultant dough is fermented for a predetermined time. The fermentation time of a straight dough depends upon the strength of flour.

2. Salt-delayed method : This is a slight variation of straight dough method only where all the ingredients are added except salt. As the salt has a controlling effect on enzymatic action of yeast, the speed of fermentation of a saltless dough will naturally be faster, so salt must be added at a later stage.

3. No dough time method: In this method, fermentation time is not given to the dough after mixing, it is just allowed a brief period of about 30 min. for it to recover from the strains of mixing. Since fermentation time is not allowed, the twin functions of fermentation (i.e.) production of gas and conditioning of gluten are achieved to some content by increasing the quantity of yeast (2 to 3 times of original quantity) and by making the dough little slacker and warmer.

4. Sponge and dough method : In this method, a part of flour, proportionate amount of water, yeast and some quantity of salt are mixed together. This sponge is kept for fermentation for a predetermined time. When the sponge is ready, it should be mixed with the remaining flour, sugar, fat and salt and kept for one hour and baked.

5. Ferment and Dough process : This is a variation of sponge and dough method. Part of flour, yeast food and sufficient water are mixed together and allowed to ferment when the ferment is ready it is mixed into the dough along with the remaining ingredients and allowed to ferment for the second stage of fermentation. This method is used in making enriched bread, buns, danish pastry and sweet dough with milk, eggs, excessive quantities of fat and sugar.

Steps in bread making

After the raw material for bread making is correctly selected, the formula should be balanced. The raw materials should be weighed accurately. The following steps should be followed in bread making.

1. Flying ferment
2. Mixing
3. Fermentation
4. Knock-back
5. Dividing and rounding
6. Intermediate proofing
7. Moulding and panning
8. Proofing
9. Baking
10. Cooling

1. Flying ferment : Take part of water as lukewarm, add little sugar and mix. Add dried yeast and let it soak until all the yeast starts floating. Add enough flour to make a thick batter, beat the batter to incorporate some air and leave aside in a warm place for 10 to 20 minutes to allow it to raise. This mixture is known as flying ferment. Yeast activity is best at temperatures between 70-80^{0}F.

2. Mixing : Flour is sifted. Salt and sugar are dissolved in water and strained through cloth. The dough can be mixed by hand as well as by machine. Flour contains gliadin and glutenin which join together and form gluten while coming in contact with water. All the ingredients are added and mixed thoroughly. As the texture of bread is very much dependent on proper development of gluten, the mixing operations should be done carefully.

3. Fermentation : Fermentation is a process where by yeast organisms feed on sugar and produce carbon-di-oxide and alcohol. Carbon-di-oxide gas raises the dough fabric and alcohol helps in imparting flavour to the bread.

4. Knock - back : After the dough has fermented for two-third of the total fermentation time, it is knocked-back. The process of knocking back should be carried out correctly by extending the sides of the dough and putting it in the centre so that the whole mass of the dough comes in contact with fresh air and the dough is virtually turned upside down.

By knocking back process, the condition of the fermentation speed remains even throughout the dough and enhance the function of yeast and proper conditioning of gluten. The dough is again fermented for the remaining one third period during which the dough is filled with gas and the gluten is again pliable and in a fit condition for further processing.

5. Dividing and rounding : The dough is cut into pieces of desired weight by a dough cutter. Pulling and breaking of the dough should be avoided as it disturbs the trend of gluten strands thereby affecting the final texture of the product. The dough piece is rounded in order to make the condition of the piece uniform. This process is known as rounding or handing up.

6. Intermediate proofing : Before manipulating the dough further, it should be rested for 10-15 minutes. During this period, the dough is again filled with gas and gluten comes back to its pliable condition making further handling possible without tearing. This resting of the rounded dough piece is known as intermediate proofing.

7. Moulding and panning : The dough piece, soft and pliable after intermediate proof, is moulded according to the desired shape of the final product. While moulding the dough piece, it should be remembered that the moulding pressure is even throughout the process. The ratio between the size of the mould and the weight of the dough should be approximately 35cu.cm per 10g of dough.

8. Proofing : After panning, the bread is kept under suitable conditions of temperature 95 to 98^{0}F and relative humidity 80 - 83% to allow it to rise again and acquire volume. This process is known as proofing.

9. Baking : After the bread acquired its full volume, it is kept for baking. The temperature and humidity of the oven should be well maintained in order to get good results. The temperature of the oven is set according to the quantity of product, its size and its formulation. Normally bread products are baked between 400-450^{0}F. Further if a formulation contains more than 6 per cent sugar or any small amount of milk solids, the product should be baked at higher temperatures.

10. Cooling : The bread should be released from the mould immediately after baking, otherwise the moisture trapped between the bread and the sides of the mould will make the product soggy, technically known as sweating. The product should be wrapped only after the whole body comes down to room temperature. It is very much necessary that the blades of the slicing machine be checked for proper cleanliness to avoid fungus formation.

The bread is wrapped in order to protect it from the hazards of external contamination and also to prolong its freshness. Wax paper or indented polyethylene wrapping serves the purpose satisfactorily.

Bread Faults

There are a number of factors which may be responsible for creating faults in bread. However, some of the major factors which adversely influence the quality of bread are as follows:

1. Inferior quality and inadequate quantity of gluten in the flour.
2. Poor diastatic capacity of flour
3. Disproportionate quantities of raw material (i.e. formulation)
4. Inferior quality of some raw materials specially yeast and water
5. Wrong timing and temperature at which the dough is fermented.
6. Wrong methods of manipulation of dough. i.e. knocking back, cutting, rounding up and moulding
7. Improper temperature, timing and humidity conditions during proofing and baking
8. Inadequate cooling of bread before wrapping
9. Improper bread storage conditions
10. A general lack of knowledge of principles of hygiene on the part of the baker.

Bread Quality Control

In order to make a complete assessment of the qualities of bread, it should be examined both for the external and internal characteristics as follows:

External Characteristics

1. Volume : The volume of bread should always be considered in conjuction with its weight (ie. specific volume) and for a particular weight of bread, the volume should neither be too big nor too small.

2. Symmetry of shape : Excessive use of bread improves, under or over fermentation and baking conditions are some of the factors which are responsible for imparting round

shoulders, caved in sides or bottom, spoiling the symmetry of shapes.

3. Bloom : Bloom is that natural flush which can be acquired in bread only by the use of good raw material and proper care at each and every stage of processing.

4. Crust colour : Crust of bread is supposed to have a pleasing golden brown colour. Caramalization of sugars is responsible for imparting such colour to the crust.

5. Evenness of bake : A bread should have even crust colour all round.

Internal Characteristics

1. Internal colour of bread : The internal colour of bread will be influenced by the grade of flour. Factors which influence the crumb structure are quality of flour, degree of fermentation, manipulation of dough and baking conditions.

2. Structure : Structure of deficient kinds of bread products vary due to the difference in formation and the specific way in which the dough is manipulated and baked.

3. Sheen and texture : The cut surface of the bread appears bright but increased intensity of reflected light is due to the thinnes of cell walls. This is known as sheen. If a cut surface of a bread slice is gently pressed with finger tips, the peculiar sensation of touch is known as texture of bread. The texture which is soft, silky and still with certain degree of firmness is considered to be good.

4. Flavour and aroma : The byproducts of fermentation have a major role to play in deciding the flavour of bread. Salt is an ingredient which exerts a considerable influence on the flavour of bread.

5. Crumb clarity and elasticity : Dense spot, feels hard to touch and light cannot pass through bread is known as core. Improper mixing of dough is a major cause for having cores in bread. When the crumb of bread is pressed gently, it should not break and when the pressure is released, it should come back to its original shape. Good quality flour and adequate fermentation are the important factors which influence the elasticity of bread.

6. Moistness : Quality of freshness of bread is judged by the degree of its moistness. Humidity for storage of bread should be about 60 per cent.

7. Cleanliness : Cleanliness of the product is decided by the care a baker takes in handling the production.

Storage

Bread storage is important because it may be affected by rope or mold attack. Once the disease makes its appearance, the product becomes unusable which means financial loss to the baker. Therefore, it is advisable that some precautionary measures are adopted to store the bread.

- A bakery should be kept spotlessly clean all the time. Floors, walls and ceilings, tools, utensils and equipment should be maintained in a dust free condition.
- Bread should be allowed to cool down completely before it is packed

- Temperatures between 70 to 95^{0}F and humidity between 65 to 75 percent are quite suitable for bread storage
- The bread is wrapped by wax paper in order to protect it from the hazards of external contamination and also to prolong its freshness.

Bread improvers

In order to improve the quality of flour, certain food items and chemicals are added for bread making. They include milk, malt, fat, sugar, eggs, soya flour and GMS (Glycerol Mono Stearate) an anti- staling agent. These prolong the shelf life of bread.

6.4. Biscuits and Cookies

In order to bring satisfactory biscuit products the ingredients used play a vital role. The use of suitable food ingredients and equipment will help to produce a perfect acceptable product.

Ingredients needed : The main ingredients in most types of the biscuits are as follows:

1. Flour
2. Sugar
3. Fat
4. Water and milk
5. Baking powder
6. Essence

The relative proportions in which these ingredients are used differ according to the variety of biscuits being made. Aeration of biscuits is accomplished by means of baking powder. The dough ingredients and the doughing liquor are mixed together mechanically to give a uniform but stiff dough. This dough is mixed until it has acquired a uniform texture and thickness. The use of colours and flavours are optional.

Biscuit Flour : Biscuit flour is made from wheats of low protein content. Depending on the type of biscuit special types of flours are used. The flour should give a dough having more extensibility, but less spring (resistance) than bread dough. Dough pieces should retain their size and shape after being stamped out. The extensibility of biscuit flour dough may be increased by the addition of sodium metabisulphite to the dough.

1. Plain Biscuit Preparation

Ingredients	Quantity
Maida	500 g
Sugar	250 g
Milk	100 g
Baking powder	5 g
Butter (fat)	400 g
Vanilla essence	2.5 g
Salt	a pinch

Method

1. The dry ingredients are mixed and sifted together and butter is added to the mixture.
2. Optimum amount of milk is then added and stirred until the mixture stiffens.
3. The biscuit dough is then kneaded on lightly floured smooth surface to obtain the desired consistency
4. When the dough is sufficiently kneaded, it is rolled on baking sheets to the desired thickness
5. Then cut into required size and baked in a hot oven at (210^0 - 232^0C) for about 15 minutes.

2. Tricolour Biscuits

Ingredients	Quantity
Flour	100g
Sugar powder	50 g
Butter	60 g
Baking powder	1 g
Vanilla essence	1 g
Fresh milk	10 g
Jam	25 g

Method

1. Sift the flour and baking powder twice
2. Add butter to the flour, add sugar and mix
3. Add sufficient milk and vanilla essence and mix to a smooth and stiff biscuit dough
4. Roll the dough to biscuit thickness
5. Cut with large size biscuit cutter
6. Place half of the total number of biscuits on to a baking sheet
7. In the remaining half of the biscuits cut three holes forming a triangle with ¼" nozzle. Place these biscuits on to a separate baking sheet. Prick biscuit with a fork.
8. Bake in the oven at 375^0F for about 15-18 minutes and cool the biscuits
9. Join together one plain biscuit and one with three holes with fruit jam or butter cream
10. Fill the three holes with pink, green and yellow coloured jam
11. Now tricolour biscuit is ready.

Cookies

Cookies are made by the same general methods as are used in making conventional cakes. The ingredients are also similar to those of cakes. The main difference is the decreased amount of liquid in the cookie dough. The other differences are the increased amount of fat and egg and the smaller amount of leavening agents used. There are many varieties of cookie recipes and the different type of cookies are prepared as follows:

Drop cookies : These are made by dropping the mixture from a spoon onto a cookie

sheet and baked in an oven at 190^{0}C for 10-15 minutes until nicely browned.

Bar cookies : They are also known as sheet cookies and are baked by spreading the dough (similar to that of drop cookies) in a shallow pan. The individual bars are cut before baking, arranged on baking sheet and baked.

Rolled cookies : Rolled cookies are made from refrigerated stiff dough. The dough is rolled and cut into desired shapes and baked.

Meringue cookies : Such cookies are made with dough prepared by beating egg whites until stiff and adding sugar slowly. Other ingredients are folded in and the batter dropped on a sheet and baked.

Sponge cookies : They are like meringue cookies but using the whole egg rather than just the egg white.

1. Almond Cookies

Ingredients	**Quantity**
Flour	100 g
Butter (Shortening)	70 g
Sugar	60 g
Baking powder	1.5 g
Egg	25 g
Vanilla essence	1 g
Almond essence	0.25 g
Blanched Almonds	For topping

Method :

1. Cream fat and sugar
2. Add beaten egg with essence and salt
3. Sift flour and baking powder twice
4. Add flour and mix to a soft dough
5. Rest the dough in a cool place
6. Break into small pieces (walnut size) and make into balls and place on greased baking sheet leaving sufficient space for spread
7. Top each piece with half almond (blanched)
8. Bake in the oven at 375^{0}F for about 15 minutes till done.

2. Peanut Cookies

Ingredients	**Quantity**
Flour	100g
Baking powder	3 g

Salt	0.5 g
Butter (or) dalda	75 g
Egg	35 g
Pea nuts (Roasted and chopped)	100 g
Vanilla essence	1 g
Milk	If necessary

Method

1. Cream fat and sugar
2. Sift flour, salt and baking powder twice
3. Whisk egg with vanilla essence
4. Mix in flour and three fourth of pea nuts. If the consistency is too hard, use little milk to make a soft mixture
5. Break small portions, top with remaining pea nuts and place on greased baking sheet about one inch apart
6. Bake at 375^0F for about 20 minutes.

6.5. Bakery Unit

A systematic way of setting up a small scale bakery is as follows:

One should consider the following five points while deciding to start a Bakery.

(i) The population and purchasing capacity of the people living in that area

(ii) Availability of raw materials, such as maida (flour), yeast etc.

Bakery

(iii) Transport and communication
(iv) Availability of electricity and other fuels
(v) Availability of potable water

Location

The following main factors should be taken into consideration before making a choice of location for the bakery.

(i) Industrial development taking place in the surrounding area
(ii) Schools, colleges, hotels and hospitals are located nearby.
(iii) While selecting site, it is generally considered as advantageous when the bus stand and railway stations are in the neighbourhood of the bakery.

Government Procedures

The detailed information on the government procedure can be obtained from the office of the State Directors of Industries and Small Industries Service Institutes.

Arrangement for Finance

The financial planning of project is a very important factor in a country like India, where the prices of most of the raw materials are fluctuating heavily. The main problem which is faced by practically every entrepreneur is getting loans from banks and financial institutions in time. Proper precautionary measures must be taken for effective planning of the finances.

Design of the Plan

The machinery layout can influece erection cost, operating and maintenance cost, safety and convenience. The following points may be used as guidelines for layout planning.

(a) A flow chart indicating the flow of materials should be first prepared and then it should be arranged in a proper way.
(b) Sufficient distance must be kept between each process or storage equipment of the major type to provide enough space for the movement of men, material and sometimes the machinery.
(c) The baking oven should preferably be located in one corner of the plant which is open from all sides rather than in the middle or centre of the plant.

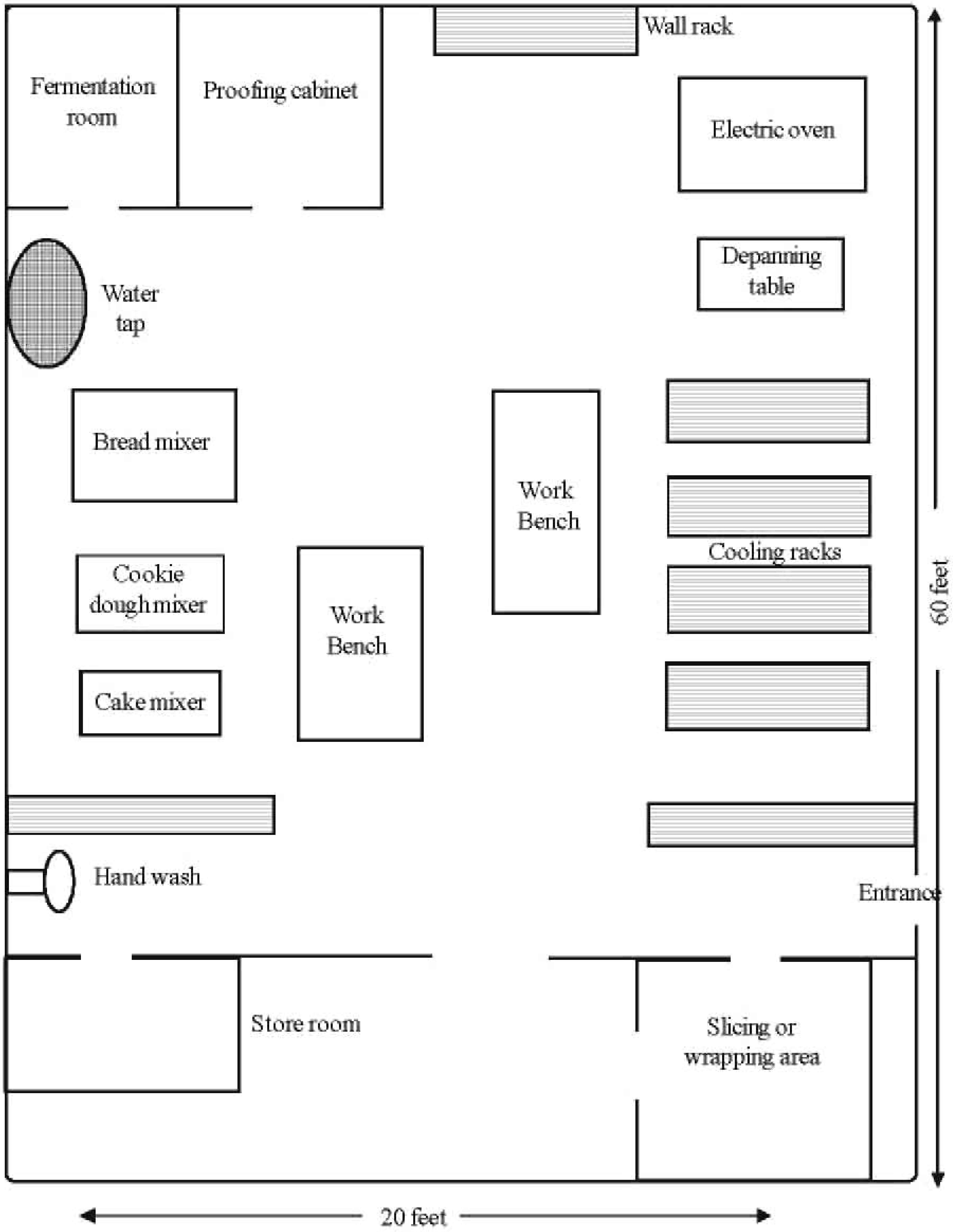
A model lay out plan of the bakery unit is given in Figure 6.1.

Selection of Equipment

Type of equipment selected will depend on the types of products, the volume, the size and the profitability of the products to be manufactured.

Total space required for the bakery

A minimum area of 1200 sq.ft. is required for the production of 3000 loaves of 400g each per day (ie. flour consumption will be approximately 900 kgs) which can accommodate future expansion upto 5000 to 6000 loaves of 400g each per day.



Plant Layout of a Small Bakery

Figure 6.1

Electricity

The electrical installations vary from place to place and therefore it is essential that data should be obtained from local Electricity Board regarding the approximate cost of the wiring and cable laying charges to be paid to the Electricity Board including deposits. The estimated cost of the consumption varies from place to place.

Equipment Needed for a Bakery Unit

1. Bread kneading Machine
2. Bread Moulding Machine
3. Power Operated Slicer
4. Bread Wrapper and Sealing Machine
5. Wooden tables of different sizes
6. Oven (Electrical)
7. Storage cabinets
8. Baking trays
9. Racks for cooling breads
10. Weighing scales and weights
11. Office tables and chairs
12. Bread tins
13. Cake moulds
14. Flour sieves
15. Egg beater (Small and big)
16. Vessels of different sizes
17. Spoons
18. Knives
19. Boards

Questions

SECTION - A

I. A. Choose the correct answer

1. Breads are classified under

   a) Air-leavened b) Chemically leavened c) Yeast leavened

2. Shortenings are

   a) Fats and oils b) Sugar c) Baking powder

3. Yeast produces .... gas

   a) Oxygen b) Carbon-di-oxide c) Nitrogen

4. Functional protein of wheat flour is

   a) Lysine b) Gluten c) Tryptophan

5. .... is the outer layer of kernal in wheat

   a) Aleurone layer b) Germ c) Bran

6. In high quality cake making .... type of wheat flour is used

   a) Bread flour b) Soft flour c) Self-raising flour

7. Humidity for storage of bread should be

   a) 50% b) 60% c) 70%

8. The moisture in bread making flour should be about

   a) 10% b) 15% c) 20%

9. Biscuit flour is made from

   a) Weak flour b) Sheet flour c) Medium strong

10. Bar cookies are also known as

    a) Rolled cookies b) Sheet cookies c) Sponge cookies

B. Answer in one or two sentences

1. Give examples for chemically leavened products.
2. Give two examples for the bakery product where there is no use of baking powder.
3. Name the two forms of yeast
4. Name any two leavening agent.
5. What are the two kinds of baking powders?
6. How do you improve the nutritive value of bread?
7. Write any two types of bread making.
8. Where is aleurone layer situated in wheat?
9. Write any 2 equipments needed for a bakery unit.
10. What is the role of egg in bakery products..

SECTION - B

II. Write in five lines

1. Define baking and write the types of bakery products.
2. Write briefly the role of yeast in bakery products.
3. Write on the types of wheat.
4. Write on the role of sugar in baking
5. List the types of bread making.
6. List the steps in bread making.
7. What is proofing?
8. Where should be the location of a bakery unit?
9. What are the different types of cookies?
10. Write short notes on straight-dough method.

SECTION - C

III. Write in one page

1. Enumerate the principles of baking.
2. Discuss the role of flour and yeast in bread making.
3. Explain any three types of bread making.
4. Explain on flying ferment, mixing and fermentation.
5. Draw a wheat grain and explain.
6. What are the factors that adversely influence the quality of bread?
7. Write the method of storage of bread.
8. How do you design a bakery unit?
9. What are the types of cookies? Give one recipe.
10. Discuss on the different types of flour.

SECTION - D

IV. Write in detail

1. Discuss the role of different ingredients in bread making.
2. Enumerate the steps in bread making
3. Write on bread quality control.
4. Discuss on the baking ingredients.
5. Draw a bakery unit plan and explain.

7. PRE SCHOOL CHILDREN

7.1. Growth and Development

Significance of Child Development : Study of child development helps to understand the needs and methods of satisfying the needs thus helping in the wholesome personality development of children. It helps to know the normal developmental pattern. Knowledge of child development will help to solve behaviour problems in children and also help to locate reasons for behaviour problems and suggests treatment for the same. It tells about the teachable moment, it is the time when the individual is most ready to be benefitted from experience. The knowledge of teachable moment help to stimulate the development in children at the most appropriate time. Child development principles help to improve the educational techniques in the classroom.

Meaning of Growth and Development : Though many people use the term growth and development inter changeably, there is a difference between these two.

Growth : Means increment of body tissues. Specifically it refers to increase in height and weight. It is the quantitative change occurring in the body.

Development : It refers to those changes which are qualitative in nature. Hurlock defines it as a progressive series of maturity. He suggests that development follows an orderly pattern and it is not haphazard.

Principles of Growth and Development : Knowledge of the principles of growth and development help to understand the children better.

The principles are as follows:

1. Development involves changes

   a. changes in size

   b. changes in proportion

   c. disappearance of old features

   d. acquisition of new features

2. Development follows a pattern: Development occurs in an orderly patterned fashion as given in figure 7.1.

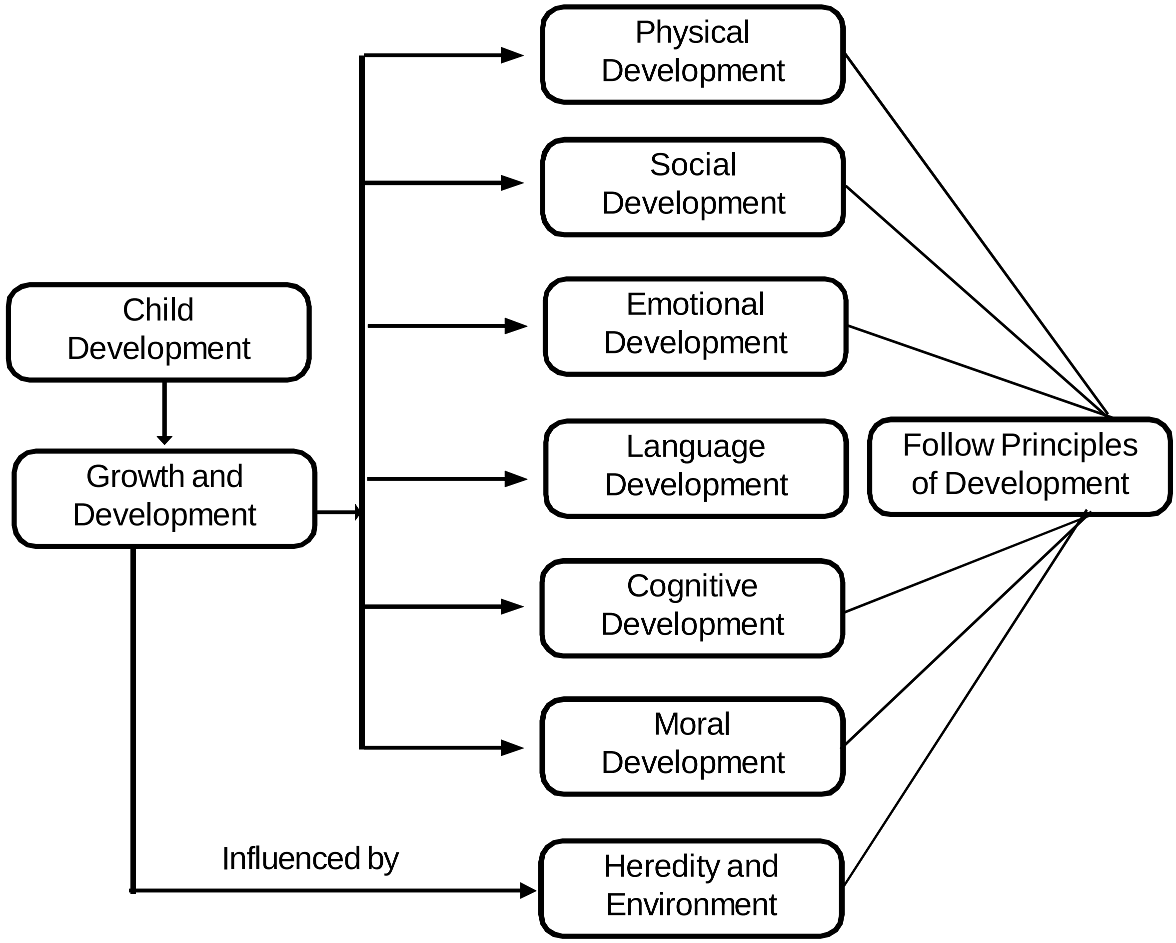


Figure 7.1

3. Development proceeds from general to specific responses
4. Most traits are correlated in development
5. Development is predictable
6. Problem behaviour occurs in stages of development
7. Development is continuous and there are individual differences
8. Development comes from maturation and learning

Factors influencing development of children

1. Heredity
2. Ordinal position in the family
3. Intelligence
4. Glands and internal secretions
5. Nutrition
6. Physical defects

Stages of Life Cycle or Stages in Life Span

1.	Prenatal period	:	Conception to birth
2.I	nfancy	:	Birth to end of second week
3.	Babyhood	:	End of second week to end of second year
4.	Early childhood (Preschool)	:	Two to six years
5.	Late childhood	:	Six to ten or twelve years
6.	Puberty or pre-adolescence	:	Twelve to fourteen years
7.	Adolescence	:	Fourteen to eighteen years
8.	Early adulthood	:	Eighteen to forty years
9.	Middle age	:	Forty to sixty years
10.	Old age	:	Sixty years to death

7.2. Infancy

According to Hurlock the period of neonate is called as the period of infancy. It is a period of complete dependancy. Before birth the baby was inside the mother's womb in a comfortable environment. All the needs of the foetus were taken care of by the mother's body. But once the baby is born the baby has to do such functions as breathing, ingestion, digestion, excretion etc. by himself. He has great capacity for learning. Instinctive behaviour is graudally replaced by learned behaviour. All gains are consolidated during childhood. Physical development is rapid in infancy, with a marked increase in muscular co-ordination. Intellectual development is equally rapid. The nervous system is more mature. Vocabulary is developed allowing him to express his thoughts, feelings and emotions. Socially he loves to associate with people he is familiar with. Self assertion and self love are two significant characteristics of this stage.

Sense organs are well developed, sense of curiosity can be exploited to teach and socialize him. Physically active and alert, he indulges in play, dance and other activities. He indulges in fantacy and imagination. He is not aware of the reality.

The development tasks of babyhood

1. An age of rapid growth
2. An age of decreasing dependency
3. Foundation age
4. A hazardous age
5. An appealing age

Baby hood is one of the two periods of rapid growth during the life span.

The developmental tasks of childhood

1. Learning to walk
2. Learning to take solid food
3. Learning to talk
4. Learning to control elimination processes of body waste
5. Learning sex differences and sexual modesty
6. Learning to distinguish right and wrong consciousness
7. Achieving physiological stability
8. Learning to relate oneself emotionally to parents, siblings, peers etc.
9. Forming simple concepts of social reality
10. Perception and participation in formal education in school

Pre School Age

This is an important period in the life of an individual. Significant changes occur in the child in all the areas of development, namely physical, social, emotional and intellectual. The major features of early childhood or pre school years are given in figure 7.2.

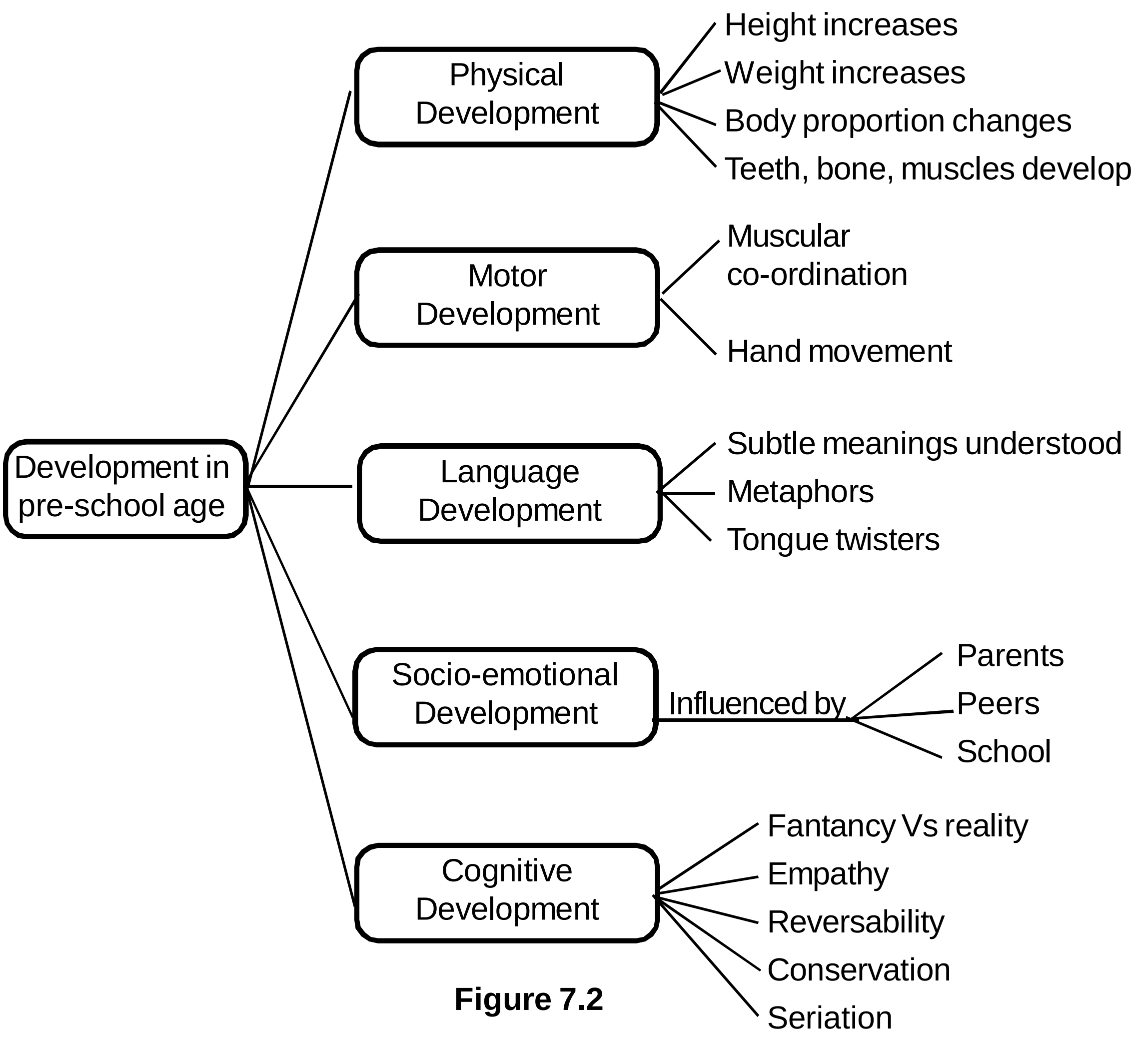


Figure 7.2

1. The childs physical abilities expand to a considerable extent.
2. Motor skills emerge and enjoys gross motor or large muscular activities and do things by himself.
3. It is a time of increasing social development
4. Cognitive development also expands. It is a period of logical thinking and operations. He learns experiences with real objects and things.
5. He has increasingly longer attention span which helps in his intellectual development.
6. In the area of emotional development, he has increased ability to control his emotions and learns acceptable ways of emotional expression
7. He has desire for social approval, co-operation, sympathy, friendliness and generosity.

7.3. Pre School Children - Needs

Human needs are as complex and varied as human beings. When the needs are not met an individual is said to be in a state of disequilibrium. The satisfaction of these needs is essential for life to continue. Pre school children have a number of needs to be satisfied. His needs grow as he grows. All these needs must be satisfactorily satisfied for proper personality development.

Classification of needs: The needs of children can be grouped as biological needs or basic, social and emotional and Intellectual needs

a. Biological Needs : These are the needs which must be met if an organism is to survive. Need for food, water, oxygen, rest, sleep etc. are examples of biological needs. Other needs in this category include need to avoid danger, need to relax and need to recover when ill.

b. Social and emotional needs: These needs refer to psychological needs. For wholesome personality development it is not enough that the physical needs alone are satisfied. When psychological needs are not met there are chances of development of behaviour problems like aggression, withdrawal, learning disabilities etc. Children need to be loved, need to feel secure, need to express oneself, need to be independent and need for recognition. This will develop a meaningful, happy and socially acceptable relationship with others.

c. Intellectual Needs : These include the need to think, the need to know facts need to relate and interpret, need to organise and need to work towards a goal. Answering children's questions and stimulating environment which arouses curiosity will satisfy his intellectual needs.

Factors helping children to fulfil their needs

1. Learn thoroughly the dynamics of behaviour of each child.
2. Make our aims and expectations clear to the child

3. Provide healthy creative opportunities for the child to grow and develop at his own pace.
4. Teachers and parents should be a good model and be an example since children learn what they live.
5. Accept the child for what he is and respect him as an individual having certain rights and responsibilities.
6. Regulate his emotional responses constructively and recognise his positive efforts.
7. Support him in meeting his developmental tasks.

Habit formation : A habit is defined as an action that becomes automatic with repetition. A habitual action is one which is performed with little or no thought and approximately in the same way.

Habits play a very important role in one's life. Good habits require learning and knowing of so many things with ease and facility brings great economy in one's life. Bad habits create obstacles in the path of his proper development. It is therefore essential that proper care should be taken to develop desirable habits of work, thought and feelings of children from the very beginning.

Principles of Habit Formation: Habits are not innate in human beings. It is learnt by doing an action repeatedly. There are certain principles which govern habit information. They are

1. Principle of repetition - an action has to be repeated to form a habit.

2. Principe of effect - The effect that the action produces on the child during initial activity will determine whether the child will repeat the action or not. Rewarding an activity reinforces the activity and the child is likely to repeat it, whereas punishment will help in the elimination of bad habits.

3. Principle of learning - All our habits except a few are inherited from parents. Since most of the habits are learned they can be easily unlearnt. When an action is not repeated it is likely to disappear.

4. Prinicple of continuity and consistency - Unless the parents or the child are serious and firm in repeating an action it can never become a habit. The parents should be firm in making the child repeat the action.

5. Set up definite specifications for the new habit - In order to develop regular study habits, it is not enough if the child is told so. He must be given a definite schedule of hours and subjects to be studied so that he would be free from doubts and confusion.

6. Start along the right track - In an attempt to form a new habit, one should start in the right direction from the very first time.

Behavioural Problems : When a child behaves in a way that is different from the normal form of behaviour expected of that particular age, he is said to exhibit problem of behaviour. Such a deviant behaviour causes problems to him and also to others, hence they are called behavioural problems.

Common Behaviour Problems : Common behaviour problems include enuresis (bed wetting), thumb sucking, fear, stealing, telling lies, destroying things and stuttering.

Causes for Behaviour Problems

a. Physiologial causes : Physical defects like deaf, dumb, cleft palate, timidity, stealing etc. in order to attract the attention of others.

b. Sense of insecurity : When parents do not love a child adequately or punish him and children with step parents may develop the sense of insecurity, they behave in an embarassing way in order to take revenge on parents.

c. Parental attitudes : Conflict between parents and parents interrupting or interfering with child's activities, cause anxiety to children that leads to stuttering, bed wetting etc.

d. Poor models : When parents and sibling themselves exhibit problem behaviour children tend to imitate them.

e. Early life experiences : Some behaviour problems like phobias and bed wetting arise from deeply disturbing experiences in early childhood.

Common behaviour problems are listed in Table 7.1.

Table 7.1: Common Problem Behaviours Observed among Young Children

	Behaviour	Causes	Do not	Do
A.	Wets the bed	The child is not ready for training. Fear, Insecurity	Threat or punish. Insist on prior information, Tell you do not love the child	Accept as he / she is Accept accidental bed-wetting, Help and encourage the child to become confident
B.	Sucks the thumb	Need for seeking love, comfort and assurance. Tiredness, hunger, dissatisfaction, boredom	Punish or scold. Tie finger or smear them with bitter medicine	Provide sucking satisfaction. Offer love and affection. Divert and involve the child in other activities
C	Tells lies	Fear of punishment Exaggeration Imagination Attention seeking	Preach or punish or reject Make him apologize Get upset	Understand the reason Give the needed attention Provide opportunity for enriching the imagination Tell the truth
D	Fears	Review's painful experience Needs parents closeness	Force or seek reason for fear, shame or threaten	Reassure and comfort Make the environment a happy one. Encourage efforts Avoid fearful experiences and help him to help himself

	Behaviour	Causes	Do not	Do
E	Steals	Ignorance of property right unsatisfied needs, irriation, hostile feelings	Scold, make bad, Punish or reject, Cut off love, Humiliate before others	Let the child own things and get a sense of ownership. Be kind, understanding and not too strict. Provide creative outlets Help make real friends
F	Destroy things	Feeling of helplessness, jealousy, boredom, attracting attention of other	Scold, shout, punish, spark or hit	Keep precious things out of reach. Provide place for play Divert and involve the child in other activities

Deviation from normal behaviour needs remedial action as said above and that is the best way to avoid also, what we need is more love, more understanding, more attention and more patience.

7.4. Learning

Learning is one of the most important component of cognitive development. Learning experiences affect concept formation and intellectual development. Out of the different studies on defining the process of learning, the following points emerge

- Learning means modifying and changing one's behaviour with reference to achieving a particular goal.
- Learning means the development of a method for dealing with problems.

Needs : Learning begins with the need of the learner. Goal setting helps in making learning concrete. If children are not ready to learn, teaching may be a waste of time and effort.

Many a time adults are so anxious that the child should do things that they impose. Many parents start teaching children reading and writing too early. As a result, the child becomes frustrated. Learning readiness is necessary for effective learning, reading before a child is ready to learn.

Learning involves the following changes :

(i) Development of skills
(ii) Acquisition of habits
(iii) Memorization
(iv) Modification of perception
(v) Improvement of insight
(vi) Elimination of error
(vii) Alteration of emotional responses

Conditions for learning : The following conditions have been found to be important in ensuring good learning:

a. Physiological factors : The physiological factors are sense, perception, physical health, lack of fatigue, proper food and age.

b. Psychological factors : Mental health, motivation and interest, success and praise, rewards and punishment are the psychological factors.

c. Environmental factors : Environmental factors like calm atmosphere, good illumination, ventilation, adequate space and effective methods of teaching also stimulate the learning process.

Learning through play : Play is an expression of the creative activities of the child. It is marked by freedom and joy. Play is necessary for the growth and perfection of the physical and mental powers of the child.

Significance of play

1. Play contributes to healthy development of the body controlling strong muscles to become skillful. Play also serves as an outlet for the surplus energy.
2. With all types of toys, the child learns the shape, size, colour, texture, number and qualities of objects as well as their significance.
3. Exploring, collecting and experimenting with play things will enable to develop mentally and physically.
4. Play is the most creative form of learning.
5. Through games with peers and adutls, a child learns to give and take, co-operate, to be tolerant and develop other social adjustments.
6. Play offers an outlet for the child to express his cultural instincts and emotions.
7. Play helps the child to distinguish between reality and fantasy.

Types of Play : The type of play a child prefers will depend upon his age and level of development.

1. Free spontaneous play : It is an unoccupied play behaviour which does not have any rules and regulations. it can be extended to any length of times. This is the earliest form of play found in babies.

2. Dramatic play : This is also called make-believe play. This form of play is common among pre-school children. Dramatic play helps the child to test his abilities and to increase their vocabulary.

3. Day dreaming : Day dreaming is a form of mental play. The child finds enjoyment in day dreaming especially when he does not have anything to do.

4. Constructive play : Some children create new things, new patterns and new ideas of play with what they have. Drawing is one of the constructive plays.

The other types of plays are singing, collecting things, games and sports, reading, watching movies, listening to radio and watching television.

The amount and type of play equipment available have marked influence on the play life of the child.

Play materials suitable for children of different ages

First year

Dangle toys for cart or carriage
Bell shaped rattles
Soft rubber squeeze toys
Colour cones
Stuffed toys
Interlocking plastic rings
Role play
Peg board with a few large pegs
Rocking toys

2 - 3 years

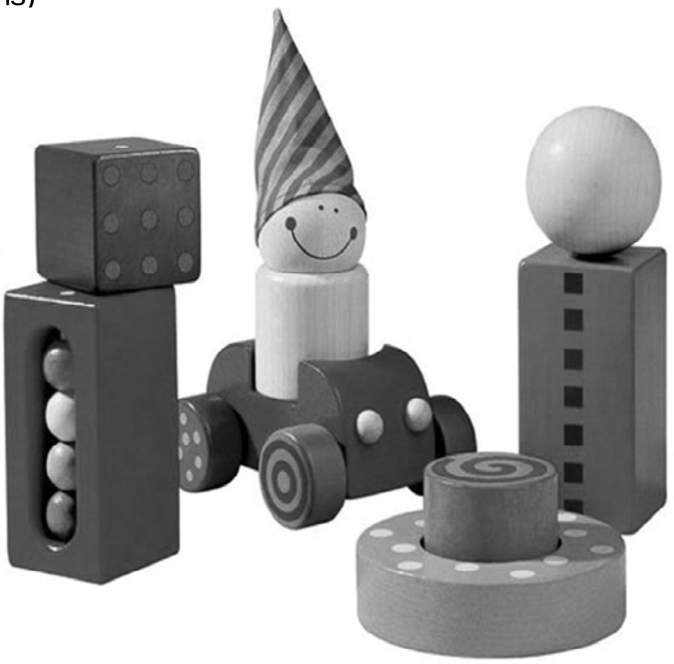
Large crayons
Block of assorted shapes
House keeping toys
Sand box
Washable dolls
Wooden puzzles
Toy telephone

3 - 4 years

Hammer with peg board
Jungle gym
Vehicles to ride in (fire engine, tricycle, car)
Musical and rhythmic toys (drums)
Large brushes for painting
Colouring books
Light weight bat and soft ball

4-5 years

Plastic blocks
Wooden train with wheels
Small car and lorries
Black board
Toy bed
Rocking board
Sticks of different colours
Xylophone and other toy music



5 - 6 years

Doll feeding sets	Wheeled toys (animals and vehicles)
Cosmetic set	Doll furniture
Hand puppets	Foot ball, badminton
Ping-pong sets	Carrom board

Accessory for word building games (Scrabble)

Factors to be noted while selecting toys are given below:

1. One of the basic principles involved in the selection of toys are safety.
2. Reasonable precautions should be taken to avoid dangerous toys and materials.
3. Simple toys usually hold more challenge than complicated toys and have more different uses.
4. The construction and the mechanism of the toys must be easy to understand and manipulate.
5. In the choice of play materials attention should be given to equipment that involves the use of large and smaller muscles and things that stimulate imagination, creativity and concentration
6. Children like best toys, with which they can imitate familiar adult activities.
7. Flexibility and versatality of toys are also important.
8. Toys, which lend themselves to a variety of uses, allow the child to work out his own ideas and develop independence and self-confidence.
9. There should be variety in the selection of toys.
10. The greater the number of the objects from the real world represented on a small scale, the better the value of the toys.
11. The adaptability and suitability of the toys to local conditions in terms of climate must be considered.
12. The area, storage space, type of housing and architecture play an important role in determining the selection and use of toys.
13. Form and colour of a toy should be considered. Children enjoy simple decorative toys and toys in primary colours (red, yellow and blue).

Activity Based Learning (ABL)

The joyful learning experiment for school children with methods and materials devised to help the children to catch up on the lost years of childhood, seemed both appropriate and attractive to all children. The learning ladders provided structure to the curriculum and allowed every child to proceed a self-related pace.

ABL Kit: There are five subjects covered in the ABL kit of Tamil Nadu.

1. Tamil Language: The lesson begins with illustrated cards and short words that are easy to write rather than with the alphabet sequence.

2. English: Similar method as Tamil is used for teaching English also.

3. Mathematics: It is learnt through using attractive montessori materials, designed systematically for the fundamental principles of addition, subtraction, multiplication and division.

4. Science and Social Science: Cards are largely based on the text book with a variety of activities attached to every chapter.

5. Puppetry, Story telling: Reading of story books, paper crafts, drawing, collage and many kinds of group games played outdoor.

Activity Based Learning

Salient Features of ABL Method

1. Brings blackboard to the eye level of child instead of teachers, every child can proudly own a part of the board.
2. Learning mateirals are not systematically stacked on the shelves, but they are colour-coded for each class level. Also logos of animal and insects forms are used for different aspects of the curriculum, when the child completes one set, there is a card for self evaluation. This can be administered by oneself or with the assistance of another child.
3. For the children there is no failure, in conventional school system so many children drop out of school because they fail.

4. Children have a sense of liberation from ranking here. No child is “better than” or “worse than” another.
5. By pairing an advanced learner with a slower one for specific exercise brings a kind of peer teaching and it works well.
6. Entire system allows for diversity and differential rates of progress. The achievement chart clearly shows the positions of the children in each area. Thus the teacher is enabled to track every learner’s progress.
7. Age is a simple solution to the complicated issue. This system absorbs different age groups and different ability levels within the same age group.
8. Taking daily attendance is a ritual in most schools, but in ABL method this process is made child friendly. There is an attendance card for each child to be filled up every day by the child. Children love the sense of trust, that this procedure implies. Attendance cards are distributed to all and collected after filling. The entire process is orderly done and it creates responsibilities.
9. In ABL method there is no apparent discipline problems, the structured learning materials have their woven logic which supports the children’s involvement in reading, writing and calculating. Discipline is intrinsic to the material and materialized by the children.
10. One of the common problem in schooling is absenteeism. ABL has a simple strategy to take care of missed classes. The mastering of a skill is not a collective exercise. The child’s work is individual, he goes to the points on the ladders where left off and starts learning from there.
11. Repetition of lesson acts as reinforcement. That is accepted pedagogy, instead of sing-song chanting tables or whatever the child in ABL writes in the black board first, notebook next and finally in the work book. Since he writes the same for three times, the pattern (Spelling, grammer, numbers) gets well established.
12. Order and structure in the materials seem to result in systematic habits in the children. Like the practice of putting their school bags and their footwear neatly on the verandah, the child learn to keep the materials used in corresponding shelves.
13. Once the ABL system has been mastered by the teacher and the pupils, the burden on the teacher is reduced.
14. Further upto class IV there is no homework, This reduces the teachers work considerably and enables the child to learn variety of things from family, community and nature.
15. In ABL method there is a lot of movement and activity, exchange of ideas and group work and there is no question of boredom.

Analysis of ABL:

ABL method and materials can be examined by following five lenses.

a. Clarity of lessons
b. Classroom environment
c. Children's involvement in process
d. Teacher's role
e. Scope for creativity

Language

Language is closely connected with organized learning activities. A child's skill in language determines to a large measure not only how well he learns but the extent to which his learning functions in his total behaviour. Language is a means of expression and it is necessary for communication. The pupil who is talented in the use of language will be able to think better and will make himself understood by his peers and others.

Some guiding principles for helping children grow through language experiences are

1. Language development takes place in harmony with maturation and experience.
2. It will occur best in situations, where children have something to say and are motivated in saying it.
3. Language must be considered as a part of the total life of the child
4. It proceeds best when there is a programme for a functional need for language
5. Language development at all stages is an individual matter.

Suggestions for improving children's speech

1. A free and informal atmosphere is important for good language development at any level of growth.
2. Materials must be interesting
3. Correct language habits must be practised
4. Encourage children to talk in the presence of adults so that the correctness of speech can be checked
5. Set a good model of speech for the child to imitate
6. Encourage children to learn new words and do not discourage the child from asking questions or joining in the conversation
7. Train the child to be an attentive listener. Help the children to avoid faulty speech in a tactful and constructive way
8. Guide the child to express himself clearly.
9. Encourage the child to talk when he is with his agemates.

Factors affecting language development

While pattern of speech development is the same for all chidlren, some individual variations can be noticed. These variations are found in the size of the vocabulary, pronounciations, etc. The reasons for the variations include the following:

a) Health of the child
b) Intelligence of the child
c) Socio-economic status of the family
d) Sex of the child
e) Size of the family

Interest

Interest may refer to the motivating force that impels an individual to attend person, thing or an activity or it may be the effective experience that has been stimulated by the activity itself.

The major types of interests are

a) Play interests
b) Conversational interests
c) Reading interests
d) Vocational interests

Interests are either natural or acquired. Natural interests arise from natural tendencies like instincts and emotions. Acquired interests are due to acquired dispositions like sentiments, habits, character, ideals and tastes.

During infancy, there are no marked interests, except attraction by colour, sounds and moving objects. With the maturity of sense apparatus, greater attention is paid to these aspects.

During the pre-school years, children are interested in toys of various kinds, especially those that represent moving objects like train, aeroplane.

The interests of boys and girls 5 to 10 years are varied. Girls are interested in dolls, sewing embroidery, drawing, painting and decorating. Boys emerge in outdoor games of various kinds, collection of stamps, video games etc. Sex, physical development, intelligence and environment are the common factors associated with the interest of children.

Imagination

Imagination is mental manipulation. Memory is closely related with imagination. The material of imagination is generally borrowed from man's past experience which is kept safe in this mind in the form of memory.

Imagination plays a vital role in the child's life. The child plays for hours together with the toys and derives much happiness by living in the world of imagination. Different types of imaginative plays are played by the children at different ages.

Imagination has been classfied in a number of ways, the most general classification being reproductive and creative.

1. Reproductive Imagination: Reproductive imagination is directed by extending suggestions in which the individual recalls and reproduces the past events as they were experienced by him. It is more or less a mechanical type with very little scope for new ideas and concepts to be incorporated.

2. Creative Imagination: It is not merely a reproduction of external happenings, but it has original imagination. These have been divided into two classes as Passive Creative imagination and Active Creative imagination.

Imagination is also essential for discoveries and inventions. Fairy tales and various myths are the outcomes of imagination. It plays a significant role in reasoning and problem solving.

Attention

Attention is the concentration of consciousness upon one object rather than upon another (Dumville). Attention is closely related to the processes and products of learning. Attention denotes a state of physical as well as mental preparedness and alertness on the part of an individual. The product of result of interest is attention.

Characteristics of Attention

1. Willingness: Attention is a constructive act and so needs willingness of an individual to learn.

2. Purposiveness: Behind any act of attention there is a motive, intensive goal of interest. The stronger the purpose, the more intense the attention.

3. Selection of stimulus: Attention is a selective activity of the mind. It is focusing of consciousness on an idea or object of thought. People focus their mind to one specific object.

4. Basis of selection: The first fundamental basis of selection matter for attention is the instincts. Second a child is motivated by sentiments. Children attend to objects that are concrete, but the adults can attend to abstract ideas also.

5. Shift : The basis of this fact is shifting nature of attention. For example, while reading a letter an individual attention flows and shifts from one place to another.

Thinking

Thinking is essentially a cognitive activity. Thinking can be described as a problem solving behaviour in the learning process. It is always directed to achieve some end or purpose. In thinking there is mental exploration instead of motor exploration. Thinking differs from the aimless cognitive act like day-dreaming and imagination.

Elements of thinking

1. Images - mind pictures of persons, objects, scenes or heard or felt
2. Concepts - common property of all the objects or events
3. Symbols and signs - Substitutes for actual objects, experiences and activities
4. Language - reading and writing promotes thinking process.

Types of thinking :

Thinking is a mental process and it is usually classified as the following types.

1) Perceptual or concrete thinking : It is the simplest form of thinking. The basis of this type of thinking is perception (ie) interpretation of sensation according to one's experience. It is also named as concrete thinking as it is carried over the perception of actual or concrete objects or events.

2) Conceptual or abstract thinking : It is an abstract thinking where one makes use of concepts; the generalised ideas and language. This type of thinking is regarded as superior to perpetual thinking that helps much discovery and invention.

3) Reflective thinking or logical thinking : In this higher type of thinking a definite aim is to solve a problem. There is an insightful approach in reflective thinking.

4) Creative thinking : This is chiefly aimed to create something new. It is in search of new relationships and associations to describe and interact the nature of the things, events and situations.

5) Associative thinking : It is a unique type of thinking which is non-directed and without goals. Day-dreaming and fantasy fall in this category.

Memory

The ability or power of mind to store the past experiences of learning and utilising them at a later stage is known as "Memory". There are three types of memory.

1. Sensory memory : It is just the lightening traces of information sent to the brain by the senses. For example an image of the numbers seen in the phone directory reaches the sensory memory and fades rapidly unless it is transferred to the next kind of memory.

2. Short-term memory : This type of memory is also temporary, though not nearly as short-lived as the immediate memory. Indeed information stored in it ordinarily gets thrown out or forgotten within about thirty seconds.

3. Long-term memory : Information is coded to permanent storage, however it may still be lost because such factors as brain injury or loss of nerve cells in brain or old age. It is the memory that helps us to remember a number of things on a relatively permanent basis.

Forgetting

Forgetting is the loss, permanent or temporary of the ability to recall or recognise something learned earlier (Munn). Forgetting may be showed as negative emotion. Forgetting can be reduced by avoiding learning stimultaneously of similar information that which are likely to be confused. It may also be reduced by completing one learning before starting another. Emotional factors are also important in retention. Pleasant experiences are retained longer and unpleasant experiences are forgotten earlier.

7.5. Differently abled children

Children differ from one another physically, intellectually, socially and emotionally. But when differences become so significant, they need special attention, since every

individual in democracy has the fundamental right to special care, even if handicapped, teachers, administrations, social workers and the general public are concerned with the education or training of not only normal, but also of the deviants or the abnormal or who are called exceptions. Their pattern of development is different from the normal pattern becaues of certain disturbances in normal functioning. Therefore as a normal or abnormal, the sick or healthy, rich or poor, the exceptional children need extra care, love and affection. The school programmes should be designed in such a way that they ensure all round development of the differently abled children.

Definition: According to Telford (1977) exceptional children are those who deviate from the normal in physical, mental, emotional or social characteristics to such a degree that they require special services to develop their maximum capacity. Four major types of exceptional children are

A. Gifted children
B. Physically handicapped
C. Mentally retarded
D. Socially handicapped.

A. Gifted children : Marland defines gifted persons as capable of outstanding performance in one or more areas. Gifted children can be defined as those who demonstrate high ability, high creativity and high task commitment. They show consistantly remarkable performance in any worthwhile line of endeavour. Children with superior cognitive abilities are defined as gifted. They have an I.Q of 140 or above. They form a small segment of population.

Classification of the gifted children : Using I.Q. as the criterion, the gifted children could be divided into three groups.

1. Superior children with IQ of 116 to 132.
2. Very superior children with IQ of 132 to 148.
3. Gifted children with IQ of above 148.

Characteristics of the gifted children

1. Learn rapidly and easily
2. Able to perform difficult mental task
3. Possess the ability to acquire and manipulate abstract symbols
4. Use of lot of common sense and practical knowledge
5. Ability to reason out, think clearly, recognise relationship and comprehend meanings
6. Use a large number of words easily and accurately

7. Ask many questions
8. Interested in a wide range of aspects
9. Possess leadership quality
10. Alert, keenly observant and responds quickly.

Educational Needs and Provisions

A gifted child needs more experimental work with new methods rather than routine ones. They need special education that will make it possible for them to develop to the full extent. The organisational procedure which have been used to adopt instruction for the children are

1. Acceleration 2. Enrichment 3. Segregation

1. Acceleration : This provides opportunity for gifted children to move faster through regular grades by

a) Providing early admission to school

b) Double promotion

c) Telescoping grade (Covering the same curriculum in a shorter period)

2. Enrichment : This involves the provision of special activities within the regular classroom setting by

a) Providing additional reading, extra assignment

b) Making them to work on independent projects

c) Providing opportunities through various curricular activities

d) Helping them to develop habits of independent work, initiative and creativity.

3. Segregation : Organising special class or schools only for gifted children by offering advanced course and honours courses for superior students beyond usual school programme.

B. Physically handicapped: It refers to certain type of disturbance in the body resulting in its malfunctioning and thereby making one physically disabled on handicapped or one account or the other. Hunt and Marshal define orthopaedic impairment causing physical disability refers to a condition that impairs the skeleted, muscular and neurological system of the body.

Limiations of Physical Impairment

1. Poor muscle control
2. Weakness and fatigue
3. Difficulty in walking, talking, climbing, seeing, hearing, sensing etc.,
4. Paralysis, joint movement limitation

Causes of physical impairment

1. Genetic or hereditory
2. Premature delivery
3. Poverty and lower socio-economic status
4. Child abuse
5. Accident or incidental factors
6. Nutritional deficiency
7. Effect of infection and diseases
8. Severe neurological disorders like cerebral palsy
9. Brain damage or brain impairment
10. Birth injuries.

Broadly physical disabilities can be classified as follows:

Neurological	**Musculo skeletal**	**Others**
Cerebral palsy	Muscular dystrophy	Asthma
Poliomyelitis	Arthritis	Blind
Convulsions	Cleft palate	
Deaf, dumb		

C. Mentally retarded : Mental retardation means impaired or incomplete mental development

British Mental Deficiency Act (1981) defines mental retardation as a condition of arrested or incomplete development of mind arising from disease or injury at an early stage.

A mentally retarded person is not capable of managing his affairs and he requires supervision, control and care. The mentally retarded can be classified as in following table 7.2.

Table 7.2 : Classification of Mentally Retarded

I.Q	Category	Classification	Care required
Below 25	Idiot	Total	Nursing care (institutional) Totally dependent
25 - 49	Imbecile	Semi	Trainable
50 - 70	Maron	Marginal	Can be educated
71 - 85	Dull, normal	Independent	Slow learner in regular classes

Causes of Mental Retardation

The causes of mental retardation can be broadly classifed as given below:

1. Environmental factors	Illness of mother during pregnancy
	Alcohol, drugs
	Complicated delivery
2. Genetic factors	Rh factor
	Infection of brain, injury to the brain
	Down syndrome or mangolism (47 chromosomes found)
3. Organic factor	Endocrine glands mal functioning
	Critenism, cerebral palsy, brain defects

The goals of rehabilitating the mentally retarded are

1. Providing opportunities for socialization and helping the children to learn the basic skills, essentially required for day to day living
2. Helping them to develop a sense of self growth
3. Helping to function in their own home and community
4. Extending services to the parents and families to assist them in creating environment conducive to the development of children
5. Identifying the social work components for mentally retarded children.

D. Socially handicapped children

Every society clearly defined rules and norms to be followed by the network of family and individuals comprise it. In case of a violation by one or other members it is referred as an anti-social act. It involves injury either to the property or the people in the society.

Juvenile delinquent : A child or youth (minor age) who deviates seriously from the norms of his culture or society. If committed by an adult it would be punishable as crime.

Causes of delinquency

1. Broken home (family is incomplete due to death, desertion, separation, divorce)
2. Improper parental control
3. Criminal behaviour of the parents or other family members
4. Domestic conflict
5. Economic difficulties and poverty of the family
6. Monotonus, dull, uninteresting home environment
7. Injustice done to the youngsters
8. Bad companionship

9. Lack of proper discipline and control
10. Maladjustment in school and defective curriculum

Treatment and prevention: The solution to this problem requires two dimensional attack

1. Preventive measures: It involves the improvement of the social or environmental conditions which satisfies the basic needs of the individual preventing delinquency.

2. Curative measures :

It includes

a. Parental education
b. Save children from the bad company and antisocial environment. Provide conducive environment.
c. Bring rectification in school education and school environment.

Legal provision for protection of children

The children's Act amened in 1977 provides for the care of socially handicapped children such as cruelly treated children, deprived children and delinquent children.

Such type of children are placed for care in one of the following

1. Orphanage

2. Foster home: Some families take in children who are without a home.

3. Adoption

4. Remand home : These are intended for delinquent children. The staff here try to help the children to improve and adjust to life. They are trained in various arts and crafts apart from elementary education.

Question

SECTION - A

I. A. Choose the correct answer

1. Parental period is from

   a) Conception to birth b) Birth to one year c) Conception to one year

2. Need for food is

   a) Biological need b) Social need c) Emotional need

3. Enuresis is

   a) Thumb sucking b) Bed wetting c) Stuttering

4. A form of mental play is

   a) Day dreaming b) Imagination c) Dramatic play

5. Mental manipulation is

   a) Imagination b) Attention c) Internet

6. Types of thinking

   a) Five b) Four c) Six

7. IQ level of a gifted child is

   a) 116 - 132 b) 132 - 148 c) Above 148.

8. Enrichment is providing

   a) Double promotion b) Acceleration c) Segregation

9. Poliomyelites is a disability of

   a) Neurological b) Musculo skeletal c) Convulsions

10. Mentally retarded children have an IQ level below

    a) 25 b) 50 c) 85

B. Answer in one or two sentences

1. Define growth.
2. Period of neonate is also known as.
3. Define habit.
4. What is meant by ABL?
5. What is dramatic play?
6. Define attention.
7. Define memory.
8. Juvenile delinquent - Define.
9. What is foster home?
10. What is meant by broken home?

SECTION - B

II. Write in five lines

1. Development involves changes
2. The development task of babyhood.
3. Intellectural need.
4. Behavioural problems.
5. Analysis of ABL.
6. Constructive play
7. Major types of interest.
8. Elements involved in thinking process.
9. Forgetting.
10. Limitations of physical impairment.

SECTION - C

III. Write in one page

1. Explain the factors helping children to fulfill their needs.
2. Write down the principles of habit formation.
3. What are the causes for behaviour problems in children?
4. Enumerate the values of play.
5. Explain the preventive measures for Juvenile delinquency.
6. Write down the suggestions for improving children's speech.
7. Explain types of thinking.
8. Write down causes for physical impairments.
9. Explain the causes of mental retardation.
10. What are the causes for juvenile delinquency?

SECTION - D

IV. Write in detail

1. Babyhood is one of the two period of rapid growth - explain the development span.
2. Explain the salient features of ABL method.
3. Tabulate the common behaviour problems among young children?
4. Factors to be considered while selecting toys.
5. Explain the characteristics and educational provisions of gifted children.

8. MANAGEMENT

Management is the mother of all sciences. Management is an essential component of family living. Management concept is used consciously or unconsciously in daily life. It is an art of conducting and directing all or part of organization or business through deployment and manipulation of resources. Management is generic and universal. Management principles are general rather than specific to a type of firm or organization. Success in management is gained through accomplishment of mission and objectives.

8.1. Definitions:

According to Nasim (2008) Management means to get the things done in the right way by the right people at the right time or in other words it is a process where the human beings gathered in an environment to achieve the common goals effectively and efficiently.

Mary Parker (1933) defines management as an art of getting things done through people.

Management is the process of planning, controlling and evaluating the use of the resources of what we have to get what we want (Cross and Grandall).

Management is said to be a planned activity directed towards accomplishing desired ends.

Hillary (2008) defines management as the interface between interplying variables of man, money, materials, with the aim of effectively achieving goals and objectives.

8.2. Principles of Management : Management principles are statements of fundamental truth. These principles serve as guidelines for decision and action of managers.

Management principles serve three main purposes

1. To increase focus on professional managements at all levels
2. Stress be must added to value of the organisation
3. What we expect from members

Principles of Management (Henry Fayol - 1925)

1. Division of work : By separating a small part of work, the worker's speed, accuracy in its performance increases and it leads to specialization which increases the efficiency of labour.

2. Authority and responsibility : This principle suggests that there must be parity between authority and responsibility and they are two sides of the same coin.

3. Discipline : It refers to obedience and proper conduct in relation to others. It is essential for the smooth functioning of organisation.

4. Unity of command : Every subodinates should receive orders and be accountable to only one superior. It makes easy to fix responsibility for mistakes.

5. Unity of direction : This is esential to ensure unity and co-ordination of an organisation. There should be one plan of action.

6. Remuneration : Payment is an important motivation. The quantum and method of remuneration payable should be fair, reasonable and rewarding of effort.

7. Equity : Members or the employees must be treated kindly and justice must be enacted to ensure a justice in work place.

8. Order : Both material and social orders are necessary. The former minimizes loss of time and useless handling, the later is achieved through proper organization and selection of employees.

9. Initiative : Employees are likely to take greater interest in the functioning of an organisation if new and better ideas are initiated.

10. Esprit de corps : This refers to the morale of its employees in the workplace. Team spirit helps develop an atmosphere of mutual trust and understanding.

11. Stability of tenure of personnel : Employees work better, if job security and career progress are assured.

12. Subordination of individual interest to general interest : Management must see that the goals of the firms must be paramount.

1**3. Centralisation :** Depending upon the condition of the business and the quality of the personnel centralisation can be adopted.

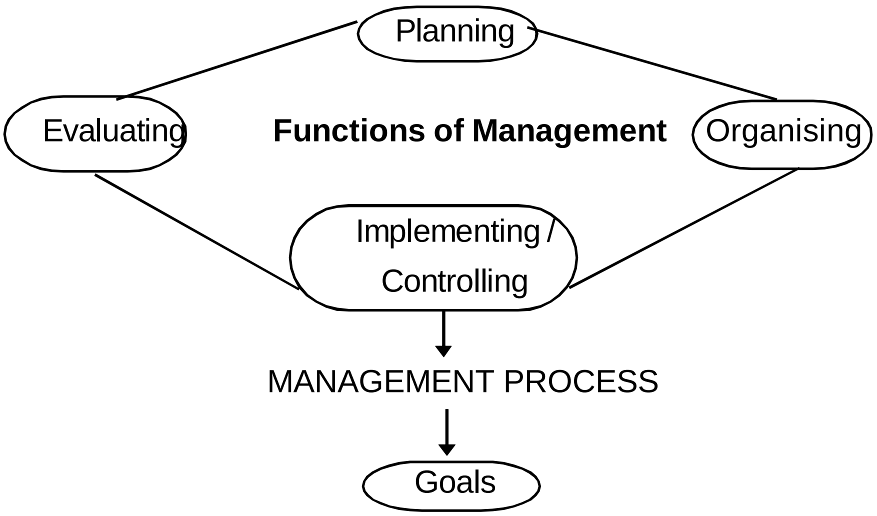
14. Scalar chain (Line of authority) : A hierarchy is necessary for unity of direction. Scalar chain refers to the number of levels in the hierarchy from the ultimate authority to the lowest level in the organisation.

These can be used to initiate and aid the processes of change, organization, decision making, skill management and overall view of the management functions.

8.3. Functions of Management

Management is creative problem solving. This creative problem solving is accomplished through four functions of management.

1. Planning
2. Organizing
3. Controlling / Implementing
4. Evaluating



Planning:

1. Planning in management enables the individual to find out ways of using resources to reach the desired goals.
2. Planning is essential only to forecast future actions and it comprises of decision making and problem solving.
3. Identification of the problem, obtaining all relevant information, formulating possible courses of action and selecting the best.
4. Planning is a series of decisions concerning sequence of action.
5. Planning is future-oriented, plans vary from situation to situation.
6. Detailed planning procedure suited to the specific need not only expedites planning but also provides basis for continued improvement

Steps involved in Planning Process

Being aware of the opportunities

↓

Determination of objectives

↓

Developing planning premises

↓

Determining alternative courses of action

↓

Evaluating alternative courses of action

↓

Selecting a course of action

↓

Preparing an operative plan by timing and sequencing the activities

↓

Preparation of a derivative plan

↓

Assessing and allocating resources and budgetting

↓

Securing participation

↓

The use of strategy

↓

Providing follow ups to the proposed course of action

Organising

1. Organising involves action to carry out the plan drawn up.
2. It helps to establish proper relationship among the various activities planned, the people and the resources.
3. It refers to the division of labour, of assigning the various tasks planned to the different members of the group in relation to their resources (in the form of capacity, time, interest, skill etc.)
4. Co-ordination of activities of the various members to give a sense of involvement and happiness.
5. Planning and organising helps to use available resources more effectively.
6. Organising prevents waste and helps to conserve money, time and energy.

Implementation / Controlling

1. Activity that aids in putting and keeping the plan in action.
2. It involves a careful observation of performance
3. It is the checking of work and performance to be sure that the procedure is moving in the planned direction.
4. There should be scope for adjustments with regard to importance of goal and also the resources available at a particular time.
5. Previous decision may be needed to substitute the previous mode of action.
6. Control helps to make a plan into a co-ordinated and workable whole.

There are different phases in the control step.

a) Energising - Initiating and sustaining the action. Setting immediate goals may be helpful in energising action.
b) Checking - Checking the progress of the plan specific devices for checking plans in action vary with resources concerned.
c) Adjusting - Adjusting the plan, thus making fresh decisions.

Controlling also involves supervising directly and guiding. The success of controlling in a plan depends upon many factors, that is if proper control and implementation is done at the right time it helps to overcome problems and barriers

Evaluating

This is the last step in management process

1. It is looking over what has been done and judging the results with respect to the goals.
2. This forms the guidelines and basis for any future planning
3. Evaluation involves complete review of the managerial process.
4. The more detailed type of evaluation is determining the degree of excellence of the managerial job.

Evaluation is divided into two types, that is

1. General evaluation 2. Detailed evaluation

General evaluation : This is more general or casual. Much importance is given to the result of the process rather than to the end of the process. For example, Family is managed well or not.

Detailed evaluation : It is more concerned with the process of evaluation and how the resources, goals, standard, helped in management.

8.4. Decision Making

Management is involved in decision making as well as performance of the physical activity. Decision making is the heart of management and requires time to complete it. It requires knowledge of an essential information, application of knowledge in life situation and also the willingness to know and to apply. Decision making is called for, when conditions have changed or a problem has arisen.

Decision making is usually defined as the act of making up the mind about something. According to Esther Crew. Decision is the smallest unit, but it is the essential unit of management. Nickel and Dorsey stated that decision making is the process of selecting a course of action from a number of possible alternatives in solving a problem.

Management is a complex process while decision making is one small unit of this process. It may be a small part but its impact is great. It is greatly influenced by goals, values and standards. It directs the way the things must happen to bring about the desired changes and satisfaction.

Types of Decision Making:

All the members are involved in decision making process. The pattern of decision making vary from culture to culture. The type of industry and the education of the staff, also influence decision making.

Decision making : There are different types of decision making as follows:

1. Individual decision: It is an individual decision taken by the person concerned. The responsibility of the success or failure is supported to be on the decision maker.

2. Collective Decision : More than one person would be involved. It requires more time if there is a difference of opinion or interest while taking group decision. Many a times a conflict and difference of options arise and becomes difficult or impossible to take unanimous decision. The decision should be fair and just to all concerned.

3. Routine decision : Not much thought considerations are involved in this type of decisions. These pertain to routine problem / activities in the home and organization. No formal analysis is made of the problem or the various solutions deliberated upon.

4. Central decision : This is an important decision. It requires thinking before deciding it. It has many supporting decisions to complete the whole task.

For example, To increase the out put of an organisation the cooperation of the employees is a must apart from managerial facilities.

5. Economic decision : It is based on allocation and exchange process relating to the use of resources in solving a problem. It is more important because we have to achieve greatest degree of satisfaction from the limited resources.

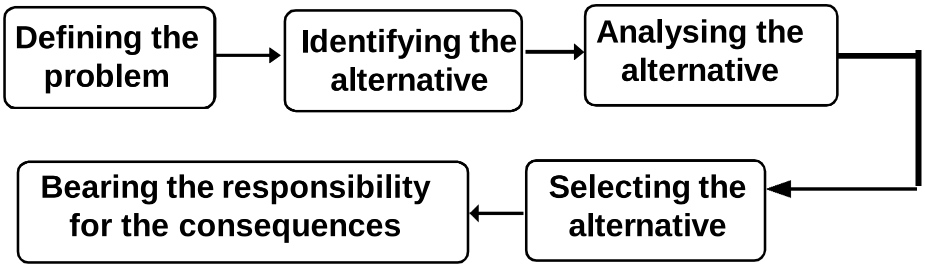
Example : If time and energy is lacking, they should be ready to spend money for finishing the work. This type of decision is greatly influenced by prior experience and actual conditions.

6. Technical decision : This decision involves a decision which will enable the combination of resources to achieve the stated goal.

7. Decision making based on experience and knowledge : There are certain decisions made in day to day living which are purely based on past experiences and knowledge. This helps a person to become more efficient and skilled in decision making process.

Steps in Decision Making

The solution to any problem proceeds through certain steps or phases. Decision making usually involves the following steps:



1. Defining the problem :

Decision making does not take place until we recognise that it is necessary. A manager has to analyse the problem with all the relevant information required to identify the problem accurately and specify why the problem has risen, what components of management are major concerns, which one is less relevant and what further information is needed.

2. Identifying the alternatives :

Once it is recognised that a decision has to be made regarding a correctly identified problem, all available knowledge plus information must be used to formulate possible alternative courses of action. This would enable to make the best solution. Factors such as awareness, intelligent creativity and resourcefulness of an individual might be related to generate alternatives.

3. Analysing the alternatives :

It is necessary to find out the advantages and disadvantages of each alternatives. After having examined all the information related to a problem choose one alternative course over another. Evaluation of each alternative is done based on goals, values and standards.

4. Selecting an alternative :

Selecting or choosing an alternative is the crucial stage in decision making. Accurate evaluation of the possible effects of the alternative is of utmost importance on the basis of evaluation. Select the one which is the most applicable.

5. Carrying out the plan or accepting the consequences :

The ability to assess and accept the consequence of the decision is a great asset for making future decisions, whether it is positive or negative. This would help to refine the skills necessary to make rational decisions. It creates self confidence in people to make effective decisions in future.

Decision making is a continuous process, improving the resources and using them to achieve goals. So decision making is therefore the central core of the management.

Question

SECTION - A

I. A. Choose the correct answer

1. .... is an act of getting things done through people.

   a) Supervision b) Co-operating c) Management

2. Series of decisions concerning sequence of action is ....

   a) Organising b) Evaluating c) Planning

3. .... is the essential unit of management

   a) Relationship b) Decisions c) Resources

4. .... is the crucial stage in decision making

   a) Selecting the alternative b) Organising c) Analysing

5. Principles of management is introduced by

   a) Henry Fayol b) Nickell c) Parker

B. Answer in one or two sentences

1. Write any two types of decision making.
2. What is esprit decorps.
3. What "Scalar chain"?
4. What is an individual decision?
5. Write the two types of evaluation.

SECTION - B

II. Write in five lines

1. Define management (2 definitions)
2. List the purposes of management.
3. Diagramatically give the functions of management.
4. What is evaluation?
5. Define decision making.

SECTION - C

III. Write in one page

1. Enumerate the steps involved in planning process.
2. Explain the different types of decision making.
3. Explain the steps involved in decision making.
4. What is evaluation? Write the types?
5. Write on the process of organising.

SECTION - D

IV. Write in detail

1. Explain the principles of management.
2. Discuss on the functions of management.
3. Define decision making. Write about the different types of decisions and the steps involved in decision making.

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